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In This Issue

More Than 2,200 Cars to Be Air-Conditioned in 1934 Page 371

An article setting forth results of a survey which indicates that railroads will have a total of more than 2,800 passenger cars equipped by the end of this year.

Regulation of Water and Motor Carriers Recommended 377

An abstract of the second of Co-ordinator Eastman's series of reports in which he finds that I. C. C. control of all transport is urgently needed to avoid chaos.

Railway Engineers Meet at Chicago 395

A special section devoted to reports of the Annual Conventions of the A. R. E. A. and the Signal Section, A. R. A.; included also is a pictorial review of current developments in the field of appliances and materials used in railway construction, maintenance and signaling.

EDITORIALS

Eastman on Transport Competition	369
The Railways and Patents	370

GENERAL ARTICLES

More Than 2,200 Cars to Be Air-Conditioned in 1934	371
Reading Net Increased 58.8 Per Cent in 1933	375
Freight Car Loading	376
Freight Train Radio Tried on New Haven	376
Regulation of Water and Motor Carriers Recommended	377

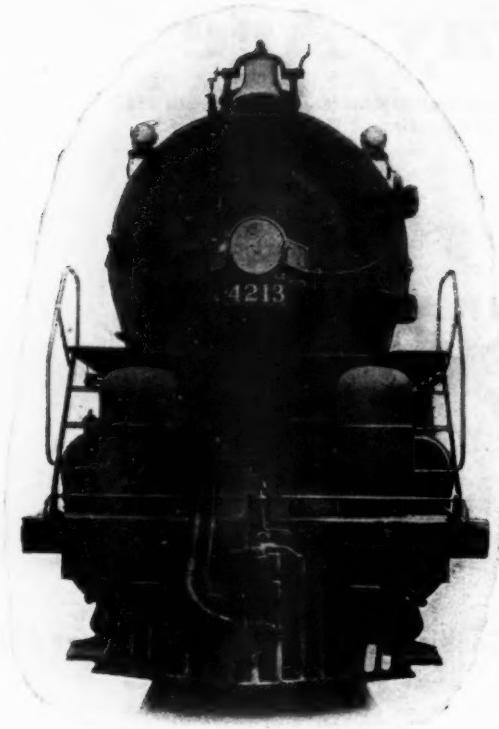
ODDS AND ENDS 386

NEWS 387

RAILWAY ENGINEERS MEET AT CHICAGO 395

A. R. E. A. Holds Annual Meeting in Chicago	396
N. R. A. A. Holds Annual Meeting	412
Signal Section Meets in Chicago	413
Manufacturers Are Prepared to Meet New Demands in 1934	418

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and repair cost*

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<i>Superheat</i>	150	250
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THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

Eastman on Transport Competition

The recommendations made by the Federal Coordinator of Transportation Joseph B. Eastman, in his report on the questions whether federal regulation of other carriers should be increased and whether regulation of railways should be reduced, are substantially those anticipated by most persons who had studied conditions and tendencies in transportation and the measures required in the public interest to correct them.

The co-ordinator points out that between 1920 and 1932 there was invested at least twenty-five billions of capital in transportation facilities in this country, or as much as had previously been invested in the railroads; that this has led to a bitter struggle for traffic, which has been intensified by the depression; and that the resulting "situation imperils the financial stability of the national transportation system, threatens wages and working conditions and creates a demoralization in rates and charges which is a menace to commerce and industry." As one remedy he favors increasing regulation of other carriers by the Interstate Commerce Commission rather than reducing regulation of the railways. However, he favors restoring to the Interstate Commerce Act the long-and-short haul provision (fourth section) which it contained before 1920. This would enable the railways, with the commission's permission, to make lower rates for longer hauls to meet competition than for shorter hauls where they do not meet competition.

The Public Interest Paramount

The regulation proposed for inter-coastal and inland water carriers and for common and contract carriers by highway would be substantially similar to that applied to the railways. They would have to get certificates of public convenience and necessity in order to operate; maintain the service they were authorized to render; publish their rates; refrain from unfair discriminations; change their rates only after thirty days' notice, and make such reports to the commission as it ordered. The commission would be empowered to fix maximum or minimum rates, or both.

Consideration of the regulation of any means of transportation should always start from the premise that the public interest is paramount. The probable effects of regulation upon the different classes of carriers, those who make their equipment and those who use their service are of secondary importance. Now, the public interest is plain enough. It is to have every kind of transportation service rendered well, and total transportation service rendered at the lowest cost consistent

with the rendering of every kind of it expeditiously, conveniently, safely and without unfair discrimination. These ends cannot be attained without the adoption of government policies designed to give each class of carriers opportunity to render those services for which it is best fitted and virtually to restrict it to those services.

Should the Railways Be Freed?

It may be claimed that this could be best accomplished by withdrawing all regulation. Experience has demonstrated, however, that regulation is essential at least to prevent unfair discrimination in service and rates, and the unfair advantages that big customers and large communities inevitably derive from such discriminations. Would it be desirable for the government to retire from all regulation of transportation excepting to prevent unfair discriminations? With the prevailing intense competition it is improbable that unfair discriminations actually could be prevented unless the government could exercise power large enough to pass upon all rates before they were put into effect. If, however, virtual freedom of rate-making were accorded to all carriers, there could be only one outcome. This would be general rate wars which might bankrupt all carriers, but in which the railways would drive most of their competitors from the field.

Those who, on behalf of other carriers, advocate virtual abolition of railway regulation, rather than increase of the regulation of other carriers, either are insincere, or do not foresee the inevitable results of that policy. If the present policy of railway regulation is to be maintained, increased regulation of other carriers is needed for the protection of the railways. If railway regulation were to be virtually abolished, other carriers would soon find that they, not the railways, needed protection. Mr. Eastman unquestionably is correct in his conclusion that maintenance and desirable co-ordination of the service of all carriers requires reasonable and comparable regulation of all.

Modification of the Fourth Section

The proposed modification of the fourth section of the Interstate Commerce Act has been made especially necessary by changes in transportation conditions that have occurred since 1920, but relates principally to competition between the railways and the waterways. Prior to 1920 the law was so interpreted by the commission as to allow the railways to make lower rates to meet competition, especially water competition, than where they did not meet it. It was recognized that a

low rate for a long haul might produce substantially less revenue per ton-mile than a higher rate for a shorter haul, but that it might be remunerative in the sense that the additional revenue derived from handling the additional traffic gained, and which otherwise would not be gained, would exceed the additional operating cost incurred in handling it. The law as changed in 1920, as interpreted by the I. C. C., has practically prohibited the railways from, in any circumstances, making lower rates for longer than for shorter hauls.

This has been brought about principally by the insistence of business interests in the western inter-mountain states, but it has been of no advantage to them, because steamship rates to the Pacific Coast have continued to be, and undoubtedly always will be, lower than railway rates to the inter-mountain states. Its effects have been to cause much traffic to move by water through the Panama canal which the railways otherwise would have handled, to place the industries of the middle western states at a disadvantage in competing with the industries of the Atlantic states for business on the Pacific coast, and to deprive the railways of earnings which they would have used in employing more labor and purchasing more materials and supplies, especially in the middle western and inter-mountain states. There is no more economic justification for applying such regulation to railway rates than to the rates of other carriers. It is not applied to other carriers, and has been applied to the railways only since 1920, when they have been subjected to more competition, and when such regulation could do them more harm, than ever before.

Equality in Terms of Competition

It is in the public interest that equal terms of competition between the railways and other carriers shall be established. The railways are the nation's most essential agencies of transportation, and it would be plainly contrary to the public interest for their competitors to continue to be allowed to attack their traffic on every front by rendering service and making rates as they see fit, and for the railways to continue to be deprived, as under existing regulation, of almost every weapon they might use to defend themselves. Two essential steps that Congress should take at its present session to establish equality of opportunity in the transportation field are the passage of legislation for the regulation of the railways' competitors, and the passage of some such bill as that introduced by Representative Pettengill of Indiana for the modification or repeal of the long-and-short haul section of the Interstate Commerce Act.

The fact that Co-ordinator Eastman has been a severe critic of private railway management, and an advocate of, and probably yet favors, government ownership, is sufficient evidence that any policies supported by him which would be helpful to the railways are not supported by him for that reason, but because he is convinced that the public interest demands them.

The Railways and Patents

What is the attitude of the railways toward patents? Is there any inherent conflict of interest between those who perfect and market a device under the protection of a patent, and those to whom it must be sold, if at all? This subject has been brought to the fore within recent weeks by the activities of certain groups of railway officers in designing specialties for use in competition with others already on the market.

The right of patent is a protection that has long been afforded the originator of a new device or material as a reward for his genius and initiative. It is a right accorded by practically all industrial nations. By reason of the protection afforded for a limited number of years, an individual or company is encouraged to incur the expense of perfecting an idea into a device that is not only practical in use, but also feasible to produce at a price sufficiently low to make its purchase by the consumer economical. Only as it accomplishes these objectives can it become a commercial success.

The railways have benefited greatly from the inventive genius without as well as within their ranks. One need look no further than the modern locomotive to visualize the outstanding contribution which such genius has made to the efficiency of railway operation. On every hand and in every branch of service one sees improvement after improvement perfected and made available for railway use by manufacturers after long and costly experimentation, impelled by the hope of reward afforded by patent protection. Without such protection no one could afford to make the necessary effort.

After perfecting a device, the developer profits from it only to the extent to which he can demonstrate to the potential user that it is to his interest to adopt it. If its advantage can be demonstrated, the promoter profits, likewise the railway; if not, the loss is that of the promoter. Yet one finds not infrequently an attitude among railway men antagonistic to devices that are patented, because of the fact that they have been patented.

Manufacturing is a highly specialized industry, quite different from that of producing railway transportation. Likewise, the problems of designing and developing railway specialties depart widely from those of maintaining and operating most efficiently the facilities required for the movement of the nation's traffic, and it is to be questioned whether the railways are equipped to perfect appliances as efficiently as outside industry. Attempts by railways to circumvent patents seem, therefore, to tend to impair industrial initiative in their behalf and to divert such interest to other industries—a tendency the railways should avoid when they are being so sorely pressed by active and ingenious competitors. What the railways need today is more rather than less new ideas. The protection afforded by patents is a stimulation to this end.



Many Club Cars Will Be Air-Conditioned

More Than 2,200 Cars to Be Air-Conditioned in 1934

Railroads will have about 2,800 cars so equipped with which to compete for passenger traffic

MORE than 2,200 passenger cars will be equipped with air-conditioning apparatus during 1934 in accordance with programs now being undertaken by the major railroads. These programs, which constitute one of the most outstanding developments in modern transportation and which comprise another step in the campaign to make railroad passenger transportation far superior to other types of conveyance, provide for the air-conditioning of all types of sleeping and passenger cars on many railroads, and on others for the equipping of observation cars, lounge cars, club cars and Pullman-room sleeping cars. While the programs of the railways, as of March 9, are tentative and are being changed daily, it has already been determined that several railroads will air-condition complete trains, while the programs of some of the other lines, which at present do not provide for air-conditioning section-sleeping cars and coaches, may yet be altered. Under these circumstances, the total number of cars that will be air-conditioned in 1934 will probably far exceed the present figure of 2,200 cars. The program at present provides for the air-conditioning of 1,300 railroad-owned and 917 Pullman-owned cars.

Large Increase Over 1933

By the end of 1934 all principal trains on the railways will be partially or fully air-conditioned, and the railways will have a total of more than 2,800 air-conditioned cars. By way of contrast, at the close of 1933 there were only 648 air-conditioned cars in service, including 404 railroad-owned and 244 Pullman-owned cars. The apparatus to be used this year, as in previous years, will include mechanical, ice and steam-ejector refrigeration systems. The programs of the individual roads, so far as they have been determined to date, are as follows:

Individual Programs

The *Alton* will air-condition all passenger-carrying cars on its Lincoln Limited between Chicago and St. Louis, Mo., eight cars being involved. Sixteen cars of the Alton Limited have already been so equipped.

The *Atchison, Topeka & Santa Fe* will air-condition 73 cars for the coming summer, including 14 dining, 10 lounge, 8 club, 4 cafe-observation and 37 Pullman cars. Orders have been placed with the Safety Car Heating & Lighting Company for the installation of steam-ejector apparatus in 66 of these cars. Upon the completion of the Santa Fe program, all cars of the Chief and the California Limited, other than coaches and section-sleeping cars, will be completely air-conditioned. Air-conditioned equipment on the Chief will include a club car; a dining car; a six-compartment, three-drawing room sleeping car; and a three-compartment, two-drawing room observation car for each of its 8 or 9 trains. On the California Limited, the air-conditioned equipment will include a dining car; a lounge car; a six-compartment, three-drawing room sleeping car; and a three-compartment, two-drawing room observation car for each of its 8 or 9 trains. In addition to these, the dining cars on the Grand Canyon Limited, the dining and 10-section observation sleeping cars on the Ranger, the cafe-observation cars on trains No. 49 and No. 50 between Kansas City, Mo., and Tulsa, Okla., and the cafe-observation cars on trains No. 9 and No. 2 between Barstow, Cal., and San Francisco will be air-conditioned. Heretofore, the Santa Fe has operated 23 air-conditioned

dining cars in its Chief, its California Limited, its Ranger and occasionally in its Chicago-Kansas City service.

The *Atlantic Coast Line* is considering air-conditioning some of its cars but has not yet decided whether to confine its program to the equipment for one train, involving about 40 cars, or to extend it to include several trains.

The *Baltimore & Ohio* will air-condition 42 Pullman-owned and some railroad-owned cars but as yet has not decided upon the number of the latter. At the end of 1933, the B. & O. was operating 62 railroad-owned and 83 Pullman-owned air-conditioned cars. Its National

between Chicago and St. Louis, Mo. Ice apparatus will be used in two parlor cars, two dining cars, two combination lounge chair cars and two chair cars, the Pullman Company doing the work in the parlor and combination lounge chair cars and the railroad in the remaining cars. Safety Car Heating & Lighting Co. steam-ejector apparatus will be installed in two combination mail-chair cars and its ice apparatus in two chair cars. In 1933 the C. & E. I. was operating 2 railroad and 7 Pullman-owned air-conditioned cars in its Century of Progress.

The *Chicago & North Western* will air-condition 25 cars. An order has been placed with the Pullman Company for the installation of air-conditioning apparatus in 11 Pullman-owned cars, while orders for apparatus for 2 combination cafe-observation-limousine cars have been placed with the Safety Car Heating & Lighting Company and for 6 North Western and 4 Chicago, St. Paul, Minneapolis & Omaha dining cars with the Trane Company. The equipment in which the Pullman Company will install air-conditioning apparatus is as follows: One nine-room sleeping observation car; 2 bedroom observation cars; 2 club cars; 1 observation car; 1 combination car containing a room, three drawing rooms and six compartments; 2 lounge observation cars, and 2 limousine parlor cars. Mechanical air-conditioning apparatus will be installed in all of these cars with the exception of the two bedroom observation cars and the two limousine parlor cars, in which the ice system of air conditioning will be installed. The cars in which air-conditioning apparatus will be installed in company shops include the 10 dining cars, the 2 observation-cafe lounge cars and 2 mid-train lounge cars. Ice apparatus will be used in the first 12 cars. Heretofore, the North Western has operated 5 air-conditioned diners in California trains.

The 25 cars will be used on three of the Pacific Coast trains, the Overland Limited, the Los Angeles Limited and the Portland Rose, on the Corn King Limited between Chicago and Omaha, Neb., and Sioux City, Iowa, on the Northwestern Limited between Chicago and St. Paul, Minn., on the Duluth-Superior Limited between Chicago and Duluth-Superior, and on the Columbine between Chicago and Denver, Colo.

The *Chicago, Burlington & Quincy* will air-condition 35 cars. Of these, 27 will be for service in trains operated on the Burlington, while 8 will be used in trains operated in conjunction with the Great Northern and the Northern Pacific. The Burlington program provides for the installation of ice apparatus in 3 dining and 3 lounge cars in the Aristocrat, mechanical apparatus in 2 dining and 2 lounge cars in the North Coast Limited, ice apparatus in 2 dining and 2 lounge cars in the Empire Builder, mechanical equipment in 1 dining and 1 lounge car and ice apparatus in 1 lounge car in the Black Hawk, ice apparatus in 1 dining car and 1 observation car and 2 salon-bedroom cars and mechanical apparatus in 1 observation lounge car in the Ak-Sar-Ben, ice apparatus in 2 observation room-lounge cars in the American Royal, ice apparatus in 2 observation parlor cars and 2 dining cars in the Mississippi Riverview, ice apparatus in 2 dining lounge cars in the Colorado Limited, ice apparatus in 1 dining parlor car in trains No. 20 and No. 21, ice apparatus in 1 dining parlor car in trains No. 26 and No. 27, and ice apparatus in 2 dining cars and 1 lounge car that will be used for extra trains or emergencies.

Orders for apparatus have been placed as follows: Pullman Company, 14 cars; Frigidaire Corporation, 5 lounge and 5 dining cars; and Trane Company, La Crosse, Wis., 3 dining and 3 dining parlor cars.

The *Chicago, Milwaukee, St. Paul & Pacific* is considering air-conditioning 82 cars. These include 1 dining car and 2 club cars in its Pioneer Limited, 2 dining

Tentative 1934 Air-Conditioning Program of the Railways

Railroad	Air-Conditioned Prior to 1934			Total		
	Rail-road Owned Cars	Pull-man Owned Cars	1934 Total	Rail-road Owned Cars	Pull-man Owned Cars	Total
Alton	4	4	8	16	..	16
A. T. & S. F.	36	37	73	23	..	23
A. C. L.	number not decided	..	..	..	..	..
B. & O.	number not decided	42	42	62	83	145
B. & M.	10	..	10	1	..	1
C. N.	number not decided	..	..	..	..	..
C. P.	number not decided	..	..	..	..	..
C. of N. J.	number not decided	..	..	..	..	..
C. & O.	5	..	5	1	51	52
C. & E. I.	6	4	10	2	7	9
C. & N. W.	14	11	25	5	..	5
C. & Q.	30	5	35	..	..	..
C. M. St. P. & P.	74	8	82	..	..	..
C. R. I. & P.	20	18	38	4	..	4
D. L. & W.	number not decided	14	14	..	..	..
D. & R. G. W.	12	..	12	..	..	..
Erie	number not decided	18	18	..	..	..
G. N.	12	8	20	..	..	..
I. C.	63	..	63	11	..	11
L. V.	number not decided	..	..	..	..	..
L. & N.	number not decided	22	22	..	..	..
M. St. P. & S. S. M.	number not decided	..	..	..	..	..
M-K-T	3	..	3	8	..	8
M. P.	22	..	22	12	..	12
N. C. & St. L.	number not decided	..	..	..	..	..
N. Y. C.	58	198	256	15	..	15
N. Y. C. & St. L.	number not decided	11	11	..	..	..
N. Y. N. H. & H.	145	number not decided	145	11	..	11
N. & W.	28	18	46	..	..	..
N. P.	19	..	19	..	..	..
Penna.	373	325	698	160	81	241
Pullman General Service & Unassigned	..	..	..	18	..	..
Reading	number not decided	..	..	..	..	..
St. L. S. F.	8	..	8	17	..	17
S. A. L.	number not decided	..	..	..	..	..
S. P.	52	14	66	14	..	14
Southern	number not decided	..	..	..	..	..
T. & P.	38	13	51	18	..	18
U. P.	12	12	24	6	4	10
Wabash	7	3	10	..	..	..

Limited, its Capitol Limited and its Columbian were completely air-conditioned. All dining cars on the system, lounge cars in its Ft. Pitt Limited and a sleeping car in its Diplomat also were air-conditioned.

The *Boston & Maine* will air-condition four dining cars and six de luxe coaches, using ice apparatus. In 1931 it air-conditioned a coach.

The *Canadian National* is considering air-conditioning some of its equipment but has not as yet formulated a definite program.

The *Canadian Pacific* is considering air-conditioning some equipment but has not decided upon a program for 1934.

The *Chesapeake & Ohio* will add four air-conditioned imperial salon cars and one business car to its present fleet. An order has been placed with the Pullman Car & Manufacturing Corporation for the installation of mechanical apparatus in these cars. The air-conditioning of all through trains of this road was completed last summer, including the George Washington, the F. F. V. and the Sportsman.

The *Chicago & Eastern Illinois* will install air-conditioning apparatus in 10 cars in trains No. 21 and No. 22

cars and 2 observation parlor cars in its Day Express, 8 dining cars and 8 observation cars in its Olympian, 1 dining car, 2 lounge cars and 1 cafe-observation car in its Arrow, 1 dining car in its Sioux, and 2 cafe-observation cars in its Southwest Limited. The 82 cars also include 50 coaches which the Milwaukee plans to purchase and 2 coaches recently reconstructed, these cars being so designed that air-conditioning apparatus can be installed just as soon as the program of the western lines is expanded to include coaches. Steam-ejector apparatus is being considered, apparatus for 30 cars having been placed with the Safety Car Heating & Lighting Co.

The *Chicago, Rock Island & Pacific* will air-condition 38 cars, including 3 cafe lounge cars in the Apache, 4 diners, 4 head-end club cars, five 5-room sleeping observation cars and six 9-room sleeping cars in the Golden State Limited, 4 observation club cars and 5 dining cars in the Rocky Mountain Limited, and 7 section dining lounge cars in the Mid-Continent Special. Safety Car Heating & Lighting Company steam-ejector apparatus will be used in 3 cafe lounge cars, 4 observation club cars and 5 dining cars, and American Car & Foundry Company ice apparatus in 4 dining cars and 4 head-end club cars. The Pullman Company will air-condition the five 5-room sleeping observation cars, the six 9-room sleeping cars and the 7 section dining lounge cars. Heretofore, the Rock Island operated 4 air-conditioned dining cars in its California trains.

The *Delaware, Lackawanna & Western* has not yet decided upon the number of cars which it will air-condition during 1934, but has placed an order with the Pullman Company for the installation of ice apparatus in 14 Pullman-owned cars and with the Safety Car Heating & Lighting Co. for apparatus for 8 cars.

The *Denver & Rio Grande Western* will air-condition five dining and seven lounge observation cars in the Scenic Limited and trains No. 5 and No. 6. An order has been placed with the Young Radiator Company, Racine, Wis., for the installation of ice apparatus in these cars.

The *Erie* will air-condition 18 Pullman-owned cars but has not decided upon the number of railroad-owned cars that will be so equipped in 1934.

The *Great Northern's* program provides for air-conditioning 12 dining cars and 8 observation cars in the Empire Builder. Ice systems will be installed in the dining cars by the Pullman Car & Manufacturing Corporation and in the observation cars by the Pullman Company.

The *Illinois Central* plans to air-condition 63 cars, including 39 dining cars, 18 cafe coaches and 6 buffet lounge cars. In 1932 the I. C. air-conditioned 11 cars in its Chicago-St. Louis Daylight Special.

The *Lehigh Valley* plans to air-condition several cars but has not decided upon the actual number.

The *Louisville & Nashville* will air-condition 22 Pullman-owned cars and some railroad-owned cars but has not yet decided on the number of the latter.

The *Missouri-Kansas-Texas* will install air-conditioning apparatus in three dining cars. The Katy air-conditioned 3 dining cars in 1931 and 4 lounge and a business car in 1933, the dining and lounge cars being used in the Texas Special.

The *Missouri Pacific* has decided to air-condition 22 cars. Mechanical apparatus will be installed in 3 dining lounge observation cars used in the Texan, in 3 dining lounge cars used in the Scenic Limited, in 2 dining lounge cars used in the Sunflower, in 2 dining parlor observation cars used in trains No. 105, No. 104, No. 109 and No. 110, and 1 de luxe lounge car and 1 dining

car used in the Sunshine Special. Ice apparatus will be installed in 3 dining lounge cars used in the Southerner, in the club end of 2 cafe coach club cars used in the Tennesseean and the Hot Springs Special, in the club end of 2 coach club cars used in the Houstonian, in 3 observation parlor cars used in trains No. 15 and No. 16, and in 1 de luxe lounge car and 1 dining car used in the Sunshine Special. An order has been placed with the Safety Car Heating & Lighting Co. for apparatus for 4 cars. At the end of 1933, the M. P. was operating 11 air-conditioned dining and lounge cars in the Sunshine Special and a business car.

The *Nashville, Chattanooga & St. Louis* is considering air-conditioning some cars but has as yet reached no definite conclusion.

The *New York Central System* has definitely arranged for the air-conditioning of 256 cars and is considering increasing this number. Of the 256 cars, 58 are railroad-owned and 198 are Pullman cars. The Twentieth Century Limited will be completely air-conditioned, while all principal trains between chief commercial centers will carry air-conditioned sleeping cars, dining cars, club cars or coaches. The 256 cars will be equipped with mechanical apparatus, orders having been placed with the Pullman Company for its installation in Pullman-owned cars and with the Pullman Car & Manufacturing Corporation for its installation in 36 dining cars and 22 coaches. The trains and cars involved are:

Train	Name	Type of Car
Big Four #3	Cleveland-St. Louis Special	Sleepers-Lounges
N. Y. C. X4	Fast Mail	Sleepers-Lounges
N. Y. C. #4	New York Special	Sleepers
N. Y. C. #5	The Mohawk	Sleepers
N. Y. C. #6	Fifth Avenue	Sleepers-Lounges-Diners-Coaches
M. C. #8	Special	Sleepers-Lounges-Diners-Coaches
Big Four N. Y. C. #11	The Wolverine-Detroiter	Sleepers-Lounges-Diners-Coaches
Big Four N. Y. C. #12	The Southwestern Limited	Sleepers-Club Cars-Ober. Cars-Diners-Coaches
Big Four N. Y. C. #15	The Southwestern Limited	Sleepers-Club Cars-Ober. Cars-Diners-Coaches
Big Four N. Y. C. #16	Ohio State Limited	Sleepers-Lounges-Diners-Coaches
M. C.-N. Y. C. #17	Ohio State Limited	Sleepers-Lounges-Diners-Coaches
N. Y. C. #19	The Wolverine	Sleepers-Lounges-Diners-Coaches
N. Y. C. #22	Lake Shore Limited	Sleepers-Lounges-Diners-Coaches
Big Four N. Y. C. #24	Lake Shore Limited	Sleepers-Lounges-Diners-Coaches
N. Y. C. #25	The Knickerbocker	Sleepers-Club Cars-Ober. Cars-Diners
N. Y. C. #26	Twentieth Century Limited	Sleepers-Club Cars-Ober. Cars-Diners
M. C. #25	Twentieth Century Limited	Sleepers-Club Cars-Ober. Cars-Diners
M. C. #26	The Twilight Limited	Lounges-Obser. Cars-Diners-Coaches-Parlor Cars
Big Four #27	The Twilight Limited	Lounges-Obser. Cars-Diners-Coaches-Parlor Cars
N. Y. C.-M. C. #39	The Gateway Exposition Flyer	Sleepers
Big Four N. Y. C. #39	Missourian	Sleepers-Lounges-Diners-Coaches
Big Four N. Y. C. #40	Missourian	Sleepers-Lounges-Diners
M. C.-N. Y. C. #40	Exposition Flyer	Sleepers-Lounges-Diners-Coaches
M. C.-N. Y. C. #47	The Detroiter	Sleepers-Lounges-Diners
N. Y. C. #59-15	The Iroquois	Sleepers-Lounges-Diners
N. Y. C. #60	Cleveland-Buffalo Special	Sleepers-Coaches
N. Y. C. #63-151	The Genesee	Sleepers-Lounges
N. Y. C. #67	The Commodore Vanderbilt	Sleepers-Lounges-Diners-Coaches
N. Y. C. #68	The Commodore Vanderbilt	Sleepers-Lounges-Diners-Coaches
N. Y. C. #89	The Forest City	Sleepers-Lounges-Coaches
N. Y. C. #90	The Forest City	Sleepers-Lounges-Coaches
Big Four N. Y. C. #104	New York Special	Sleepers
Big Four N. Y. C. #119	Cincinnati Special	Sleepers-Diners
Big Four N. Y. C. #124	The Knickerbocker	Sleepers-Diners

Last year the N. Y. C. was operating 15 air-conditioned dining cars in several of its trains.

The *New York, Chicago & St. Louis* has placed orders

for the installation of air-conditioning apparatus in some cars but has not yet completed its program for 1934. The orders let to date include apparatus for 1 business car and 2 coaches, placed with the Pullman Car & Manufacturing Corporation and 11 Pullman-owned cars, placed with the Pullman Company.

The *New York, New Haven & Hartford* has not decided on the number of Pullman cars to be air-conditioned in 1934 but has already placed orders for air-conditioning apparatus for 95 railroad-owned cars and expects to order 50 air-conditioned passenger coaches. Of the 95 cars, 2 coaches are for trains No. 174 and No. 175 between Boston, Mass., and Washington, D. C., 4 dining cars are for trains No. 26 and No. 27, and 2 dining cars are for trains No. 22 and No. 23 between Boston and New York, while 18 dining cars, 12 combination cars and 57 coaches and smoking cars are for various trains. The *Rails* Company will furnish ice apparatus for 1 coach and 6 dining cars, the *B. F. Sturtevant* Company ice apparatus for 1 coach and 18 dining cars and the *Safety Car Heating & Lighting* Company mechanical apparatus for 12 combination cars and 57 coaches and smoking cars. During the last two years, the *New Haven* has air-conditioned 2 coaches, 3 club and 6 dining cars for use in its principal trains.

The *Norfolk & Western* program provides for the complete air-conditioning of the *Pocahontas* and the *Cavalier*, the air-conditioning of a lounge dining car on trains No. 1 and No. 2 between Roanoke, Va., and Hagerstown, Md., and the *Bluefield-New York* sleeping cars on this train. A total of 46 cars are involved, including 4 passenger baggage cars, 5 coaches, 3 dining cars, four 10-section lounge sleeping cars and five 12-section, 1-drawing room sleeping cars for the *Pocahontas*; 4 passenger baggage cars, 5 coaches, 3 lounge dining cars and ten 12-section, 1-drawing room sleeping cars for the *Cavalier*; and 1 lounge dining car and two 12-section, 1-drawing room sleeping cars for trains No. 1 and No. 2. Mechanical apparatus will be used in all cars except 4 coaches, in which steam-ejector apparatus will be installed. Orders for apparatus have been placed with the *Frigidaire* Company for 4 lounge dining cars, 6 coaches and 3 dining cars; with the *Pullman* Company for seventeen 12-section, 1-drawing room sleeping cars and four 10-section lounge sleeping cars; with the *Sturtevant-Westinghouse* Company for 8 passenger baggage cars; and with the *Bethlehem Steel* Company for (steam apparatus) 4 coaches.

The *Northern Pacific* will air-condition the dining and observation cars of its *North Coast Limited*. Orders have been placed with the *Pullman Car & Manufacturing Corporation* for mechanical apparatus for 9 dining cars and 10 observation club cars.

The *Pennsylvania* will air-condition 698 cars, including 325 sleeping and lounge cars, 104 parlor cars, 179 coaches and combination passenger baggage cars and 90 dining cars on all through trains. Of the dining cars, 37 will be mechanically cooled. The remainder of the cars will be ice-activated with the exception of a few sleeping cars which, for experimental purposes, will be mechanically cooled. The air-conditioning apparatus for *Pullman* cars will be installed by the *Pullman Company*, while that for coaches and dining cars will be installed by the railroad. At the end of 1933, the *Pennsylvania* was operating 160 railroad and 81 *Pullman*-owned air-conditioned cars in its principal trains.

The *Reading* is considering air-conditioning the equipment on certain trains but as yet has not decided upon a definite program.

The *St. Louis-San Francisco* will air-condition 8 cars, including 2 coach lounge cars, 2 buffet parlor cars and

4 coach chair cars. The ice apparatus for these cars is being constructed and installed by the railroad in its own shops. The newly air-conditioned cars and the 6 cafe lounge cars, 4 coaches, 4 dining cars and 3 lounge cars air-conditioned by the *Frisco* last year, will be used in the *Bluebonnet*, the *Texas Special*, the *Meteor*, the *Kansas City-Florida Special*, the *Memphian*, *St. Louis-Oklahoma City* trains No. 117 and No. 118, No. 4 and No. 5 and trains No. 709, No. 710, No. 807 and No. 808.

The *Seaboard Air Line* has not fully decided upon its 1934 program but so far this year has placed orders for apparatus for 50 cars. Of these, 32 *Pullman*-owned cars were for the *Orange Blossom* and were placed in service on January 2. Four of these cars were equipped with mechanical apparatus and 28 with ice apparatus. In addition, orders for mechanical apparatus have been placed with the *Pullman Car & Manufacturing Corporation* for 5 coaches, 5 coach baggage cars, 3 coach dining cars, 2 observation dining cars, 2 dining cars and 1 parlor car.

The *Southern* is considering air-conditioning but has not yet reached a definite conclusion.

The *Southern Pacific* will air-condition 66 observation cars, lounge cars, club cars and *Pullman*-room sleeping cars for use in the *Overland Limited*, the *Golden State Limited*, the *Sunset Limited*, the *Cascade Limited* and other trains, making a total of 22 trains. The four trains mentioned will be completely air-conditioned, with the exception of coaches and *Pullman* section sleeping cars. In 1932 the *S. P.* air-conditioned 14 dining cars for use in its through trains.

The *Texas & Pacific* thus far has not made definite plans for 1934, it having installed steam-ejector air-conditioning apparatus in three de luxe lounge cars and three dining cars in the *Sunshine Special* and one dining car in the *Texan* in 1933.

The *Union Pacific* program calls for the air-conditioning of all cars, with the exception of section sleeping cars and coaches, on the *San Francisco Overland Limited* and the *Los Angeles Limited*, and the air-conditioning of the dining cars and observation cars in the *Portland Rose*, the *Columbine* and the *Pacific Coast Limited*. In the air-conditioning of these trains the *Union Pacific*, the *Chicago & North Western* and the *Southern Pacific* will each furnish its own dining cars but the club cars, all-room sleeping cars and observation sleeping cars are *Pullman*-owned. The *Union Pacific* has placed an order with the *Pullman Car & Manufacturing Corporation* for the installation of mechanical air-conditioning apparatus in 22 observation cars and 16 dining cars, and one with the *Pullman Company* for the installation in 13 sleeping cars. These include 2 dormitory club cars, 3 dining cars, 3 all-room cars and 3 observation cars for the *San Francisco Overland Limited*; 5 all-room cars, 8 observation cars and 3 dining cars for the *Los Angeles Limited*; 7 observation lounge cars and 4 dining cars for the *Portland Rose*; 4 observation lounge cars and 4 dining cars for the *Columbine*; and 3 observation lounge cars and 3 dining cars for the *Pacific Coast Limited*. In 1932, the *U. P.* air-conditioned 18 dining cars for use in its through trains.

The *Wabash* will air-condition 24 cars. Ice-activated apparatus will be installed in 2 *Pullman* observation parlor cars, 2 *Pullman* parlor lounge cars, 2 *Wabash* dining cars and 4 *Wabash* chair cars in the *Banner Blue Limited*; in 2 *Pullman* observation parlor lounge dining cars in trains No. 2 and No. 3 between St. Louis and Kansas City, Mo.; in 2 *Wabash* parlor lounge dining cars in trains No. 9 and No. 12 between these points; in 2 *Pullman* parlor lounge dining cars and 2 *Wabash* chair cars in trains No. 52 and No. 135 between Chi-

cago and Detroit, Mich.; and in 2 Pullman observation parlor cars, 2 Pullman parlor lounge dining cars and 2 Wabash chair cars in trains No. 4 and No. 207 between these points. In addition to these, the Wabash may air-condition cars in trains No. 17 and No. 18. During the last two years, the Wabash has air-conditioned 6 Wabash chair and 4 Pullman cars for use in its Banner Blue Limited.

The *Western Pacific* will air-condition 10 cars in the Scenic Limited, including 4 dining cars, 3 lounge observation cars and 3 Pullman cars. Orders have been placed with the Safety Car Heating & Lighting Company for steam-ejector apparatus in dining cars, with the Pullman Car & Manufacturing Corporation for mechanical apparatus in 3 lounge observation cars, and with the Pullman Company for air-conditioning apparatus in 3 Pullman-owned cars.

Reading Net Increased 58.8 Per Cent in 1933

THE Reading's annual report for 1933 discloses a happy issue from a trying year in the form of net income amounting to \$6,715,522—an increase of 58.8 per cent over 1932. The company earned its fixed charges 1.7 times and the net income, after sinking fund appropriations and dividends on its preferred stock, was equivalent to 5.5 per cent on its common stock. Actual dividends on the common stock were, however, limited to 2 per cent for the year.

The performance is the more remarkable because operating revenues showed a decline of 4.5 per cent from 1932. Rigid economies, however, permitted a reduction in operating expenses of no less than 14.6 per cent. The greatest ratio of reduction, naturally, occurred in maintenance expenses, but it is interesting to observe, as shown in the accompanying table, that transportation expenses also were reduced more than twice as much proportionately as the decline in operating revenues. Taxes showed a sharp increase. Some decreases in various items of non-operating income (principally income from securities, and rent income) were more than offset by non-recurring income totaling \$422,376 in the form of a payment by the Interstate Commerce Commission to the Reading of its share of the recapture charges against the Ironton R. R., which is owned jointly by the Reading and the Lehigh Valley.

The volume of freight business in 1933, as measured in ton-miles, was less than one per cent under the 1932 total, but the decline in freight revenues—due to lower average charges per ton-mile—was more than 1½ per cent. The great loss in traffic and earnings occurred in the passenger business—revenue passenger-miles declining 14.2 per cent from 1932, and passenger train revenue was 17.1 per cent lower last year than in the one preceding. The Reading has suffered severely not only from motor competition due to an extraordinarily intensive development of highways in its territory, but also by reason of bridges and tunnels built to replace ferries and thus further to expedite highway traffic. In addition, the Philadelphia subway system has been extended into the Reading's suburban territory. Competition of this sort is particularly depressing on short-haul railway traffic and the bulk of the Reading's business is in that category, its average haul per passenger in 1933 being less than 18 miles. The company's service, however, is maintained at a high standard—much of it

electrified—and there is reason to hope that the period of retrogression in this traffic may be nearing an end. In one important respect, at least, the company was able to improve its performance with respect to this business, that is in average passengers per car, which showed an increase in 1933 over the 1932 average.

The principal source of the great reduction made in maintenance of way expenses was charges to depreciation. Many of the other maintenance of way accounts, it is true, showed sharp decreases, but upon the largest of them all—track laying and surfacing—the outlay in 1933 was actually increased over that of 1932. The reduction in maintenance of equipment expense also, it would appear, was not made primarily at the expense of the road's equipment condition. On January 1 of the current year the company had 146 locomotives awaiting classified repairs (16.5 per cent of the total) as compared with 136 (15.3 per cent of the total) at the beginning of last year. Freight cars awaiting repairs at the beginning of 1934 were 18.9 per cent of the total on line as compared with 14.7 per cent at the beginning of 1933. The largest single item in the reduction in maintenance of equipment expenses was the outlay for locomotive repairs which was reduced from \$3,185,713 to \$2,041,479, or more than one-third. Some of the major economies in transportation expense lay in reductions in

Reading Revenues and Expenses—A Comparison

	1933	1932	+ Increase or - Decrease	%	1929
Coal Traffic Revenue.....	\$24,475,980	\$25,138,349	-2.6	\$37,485,247	
Other Freight Revenue....	19,400,315	19,439,298	-0.2	45,237,747	
Passenger Revenue	2,782,679	3,368,996	-17.4	7,080,681	
Milk Revenue	46,458	114,408	-59.3	258,795	
Total Railway Operating Revenue	48,464,052	51,806,374	-6.5	97,196,954	
Maintenance of Way Ex- pense	2,980,871	4,270,016	-30.2	14,097,108	
Maintenance of Equipment Expense	8,862,251	10,676,670	-17.0	22,000,822	
Transportation Expense	18,069,845	20,416,988	-11.5	35,698,864	
Total Railway Operating Expense	33,148,527	38,804,168	-14.6	75,929,795	
Net Revenue from Railway Operations	16,315,524	13,002,205	+25.5	21,267,159	
Operating Ratio (Per Cent)	67.02	74.90	-10.5	78.12	
Railway Tax Accruals.....	\$2,539,490	\$1,590,520	+59.7	\$4,439,920	
Net Railway Operating In- come	13,577,067	11,086,616	+22.5	17,196,521	
Non-Operating Income	2,775,713	2,760,705	+0.5	6,953,343	
Gross Income	16,352,781	13,847,321	+18.1	24,149,864	
Deductions from Gross In- come	9,637,259	9,618,532	+0.2	8,641,123	
Net Income	6,715,522	4,228,789	+58.8	15,508,740	
Rent, Interest and Other Charges Earned, times...		1.7		1.4	2.8

expenses for superintendence, train dispatching, station forces, yard and train operation and fuel. A total of 61 locomotives, 1524 freight cars, 40 passenger cars and 29 service cars was retired during the year.

There was an increase in the average net load per train from 840.6 tons to 877.4 or 4.38 per cent. As a consequence, revenue train-miles were reduced by 5.3 per cent with a reduction in revenue ton-miles of less than one per cent. The ratio of loaded to total car-miles was likewise improved and the tons per loaded car rose from 32.2 to 32.7. Freight revenue per freight train-mile rose from \$9.59 in 1932 to \$9.76 last year, while the average revenue per ton-mile declined from 1.141 cents to 1.113. Average net revenue from operations per train-mile rose from \$1.33 in 1932 to \$1.76 last year, which may be compared with the net per train-mile of \$1.55 earned in 1929 when average freight revenue per train-mile was \$10.89.

The Reading, which was one of the roads which pioneered in the establishment of highway service, continued and extended its operations during the year, operating a route mileage of 931 of bus service and 948 miles of truck routes. Early in the current year it

pooled its bus service out of New York with that of the Pennsylvania Greyhound Lines, permitting the elimination of a considerable vehicle-mileage with no reduction in schedules available to the traveling public.

During 1933 also, the Reading's subsidiary, the Atlantic City Railroad, was combined with the Pennsylvania's South Jersey lines and the new company is known as the Pennsylvania-Reading Seashore Lines. This action has saved a considerable train-mileage and has permitted the abandonment of many competitive facilities, including 84 miles of line, and has made possible other economies. Also during the year, the company was permitted to take over the 145,000 shares of capital stock of the Central of New Jersey which it owns and which was in the hands of trustees. This makes possible the co-ordination of the operations of the two properties, upon which a beginning has already been made and which is expected to continue progressively. A maturity of \$2,644,000 of bonds was met during the year by extending them for ten years. The company has no other maturities, excepting equipment trusts, to meet until 1937.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended March 3 totaled 604,137 cars, an increase of 30,766 cars as compared with the week before, which included a holiday, and an increase of 122,929 cars, or 20 per cent, as compared with the corresponding week of last year. It was also an increase of 44,658 cars as compared with 1932. Loading of forest products, ore, and live stock was less than that for the preceding week but all commodity classifications except live stock showed increases as compared with last year. The Central Western and Southwestern districts reported small decreases as compared with last year. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week ended Saturday, March 3, 1934

Districts	1934	1933	1932
Eastern	148,127	113,641	131,020
Allegheny	120,668	92,277	113,118
Pocahontas	43,249	31,246	32,972
Southern	90,581	76,499	86,980
Northwestern	69,698	55,223	63,330
Central Western	83,810	70,879	83,929
Southwestern	48,004	41,443	48,130
Total Western Districts.....	201,512	167,545	195,389
Total All Roads.....	604,137	481,208	559,479
Commodities			
Grain and Grain Products.....	29,098	27,973	31,371
Live Stock	14,031	14,038	16,952
Coal	157,714	93,910	95,367
Coke	10,792	4,879	5,084
Forest Products	21,530	15,362	20,489
Ore	2,646	1,368	2,096
Mds. L. C. L.	162,397	162,269	191,504
Miscellaneous	205,929	161,409	196,616
March 3.....	604,137	481,208	559,479
February 24.....	573,371	462,315	535,498
February 17.....	598,896	517,529	572,265
February 10.....	572,504	504,663	561,535
February 3.....	564,098	486,059	573,923
Cumulative total, 9 weeks.....	5,090,568	4,375,982	5,069,471

Car Loading in Canada

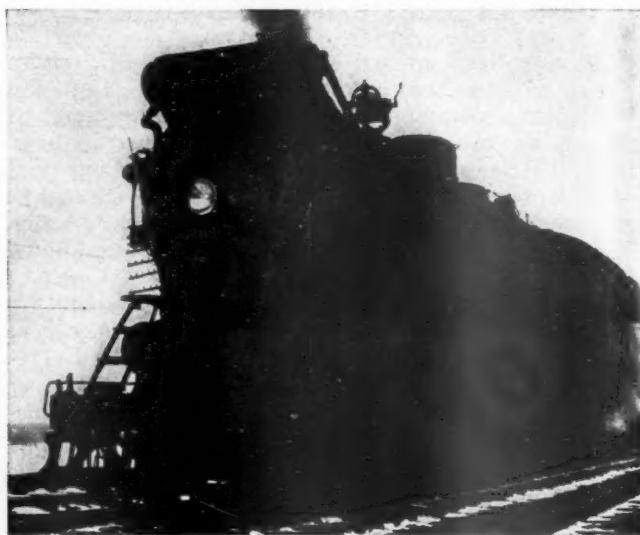
Car loadings in Canada for the week ended March 3 totaled 42,610, a gain of 1,147 cars over the previous week and of 8,399 cars over the corresponding week

last year, according to the compilation of the Dominion Bureau of Statistics.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada:		
March 3, 1934.....	42,610	25,916
February 24, 1934.....	41,463	23,465
February 17, 1934.....	40,952	23,389
March 4, 1933.....	34,211	18,019
Cumulative Totals for Canada:		
March 3, 1934.....	361,860	196,411
March 4, 1933.....	290,426	155,203
March 5, 1932.....	370,358	189,631

Freight Train Radio Tried on New Haven

WITH the cooperation of the New Haven Railroad, Westinghouse engineers installed an experimental five-meter radiophone system on one of the road's regularly operating freight trains. Complete two-way radiophone equipment is installed on both



Sending and Receiving Antenna Are Mounted on the Front End of the Locomotive

locomotive and caboose of the train, permitting the engineer and brakeman to communicate at any time.

The equipment consists of an ultra-high frequency transmitter and receiver with microphone and loud



Caboose Radio Equipment in Service

speaker located in the engine cab and duplicate equipment in the caboose. Separate antennae are used for transmitting and receiving. The two antennae used

(Continued on page 385)

Regulation of Water and Motor Carriers Recommended

Co-ordinator Eastman finds I. C. C. control of all transport urgently needed to avoid chaos

WASHINGTON, D. C.

FEDERAL regulation of all forms of transportation, but with little relaxation of the present degree of railroad regulation, on the ground that the entire transportation industry "is in need of the guiding hand of government control if a threatening chaos is to be transformed into order," is recommended by Joseph B. Eastman, federal co-ordinator of transportation, in the second of his series of reports on transportation questions, transmitted to the President and to Congress on March 10. In transmitting the report the Interstate Commerce Commission also expressed its unanimous approval of specific recommendations submitted by Mr. Eastman accompanied by drafts of bills for regulation of the water rates and service of the water carrier and motor carrier industries and of four proposed amendments to the present interstate commerce act which he recommended, with the exception that Commissioners Lee and McManamy do not concur in any amendment relating to the fourth section.

To achieve the end of a well-knit transportation system, with each form of transportation playing its appropriate part with a minimum of waste and duplication, Mr. Eastman said, federal regulation should be co-ordinated in the hands of the Interstate Commerce Commission, but specific proposals for regulation of the air lines are postponed for the present and no recommendations are made as to pipe lines.

Proposals of the railroads, submitted by the Association of Railway Executives, for relaxation of their regulation were carefully analyzed and most of them were rejected, some on the ground that they are "trivial" or had been made to emphasize the need for regulation of their competitors, and others on the ground that they would represent a backward step by removing safeguards against discrimination. It is proposed, however, to restore the long-and-short-haul clause of the fourth section of the interstate commerce act to the form which it had prior to 1920 and to give less latitude in the filing of reparation claims. No great objection is made by the co-ordinator to the proposal that laws prohibiting railroad ownership of water lines be repealed but he says that consideration of this proposal may well be postponed until more compelling reasons are advanced. He also says that the movement toward greater use of trucks and buses by the railroads is plainly one which should be encouraged but that "there appears to be no present need for encouraging a movement toward the absorption by them of truck, bus and water operations."

The co-ordinator is still studying whether and to what extent the various forms of transportation are receiving an actual or virtual public subsidy, and, if so, what should be done about it. However, the results are not yet ready for publication and they will be reserved for a subsequent report at a comparatively early date. Labor conditions will also be discussed later, and there will be further consideration of the protection of the public safety and convenience in the use of the highways.

A major part of the report is devoted to the question

whether other transportation agencies should be subjected to a greater degree of regulation or whether the regulation of the railroads should be relaxed and the answer is given that "unregulated competition may be quite as much of a public evil as unregulated monopoly." The report points out that we have followed a policy of "encouraging an oversupply of transportation service."

Discussing the means of regulation to be applied the report finds that the NRA codes have provided some means for the federal regulation of the other agencies, but that such regulation is on a temporary, emergency basis and is not well adapted for use where serious conflicts of interest between the industry, other industries, and the general public are involved; nor is it adapted to the proper co-ordination of all forms of transportation. It is found that the Interstate Commerce Commission is the natural and logical agency, well organized and trained by experience for such co-ordinated regulation. The practical objections which have been raised to regulation by the commission are discussed, including the contentions that it has too much work now, that it is "railroad-minded," that it would use railroad rates as a pattern for the rates of other agencies; and that its procedure is too bureaucratic and cumbersome. The conclusions are that these objections are not valid.

However, Mr. Eastman warns the railroads, "such regulation is in no way to be regarded as a panacea for railroad ills." The railroads, he says, "have spent too much time and attention on plans for the restriction of their competitors and too little on the development and improvement of their own service and the readjustment of their own rates." Many difficulties will be encountered, he shows, but "there is no good reason for believing that regulation cannot be made to work; and it appears that public opinion is ready for the trial." The latter conclusion is reached to a considerable extent from the responses received by the co-ordinator to his numerous questionnaires.

In connection with the questions addressed to the public in a press release on November 4, the report says, "the railroads indulged in a form of propaganda and solicited replies of the kind which they approved from numerous organizations and shippers. As a result, several thousand answers of the 'canned' variety were sent in. These have been disregarded and attention has been confined to those which appeared to be an expression of independent thought and consideration."

Recommendations

The recommendations of the report were summarized by Mr. Eastman as follows:

- (1) Enact the legislation for the federal regulation of the water carrier industry which is set forth in the bill herewith submitted as Appendix F.
- (2) Enact the legislation for the federal regulation of the motor carrier industry which is set forth in the bill herewith submitted as Appendix G.
- (3) Enact the legislation for the amendment of the

present Interstate Commerce Act which is set forth in the four bills herewith submitted as Appendix H. These bills would:

(a) Enable the Commission to prescribe minimum as well as maximum joint rail-water rates, and to establish through railroad routes where deemed necessary in the public interest regardless of the "short-hauling" of any carrier.

(b) Include ports and gateways in the protection of section 3 against undue preference and prejudice.

(c) Restore the fourth section to the form which it had prior to the legislation of 1920.

(d) Shorten the statutory periods of limitation with respect to reparation claims to one year in the case of overcharges (and undercharges) and to 90 days in the case of all other claims.

The recommendations marked (1), (2), and (3) (a) above should be considered together and are of the most pressing importance. The others may be considered separately.

I. C. C. Urges Immediate Action

The Interstate Commerce Commission said that in its judgment "the enactment into law of the first two bills is imperatively necessary under present conditions," and that the bill to amend Section 15 should be considered in connection therewith for reasons indicated in the co-ordinator's report. If the Congress should find it impossible or impracticable to undertake to enact into law all three classes of proposed legislation, it recommended that precedence be given to the first two, including the Section 15 bill. These it recommends unanimously, saying "Through our Legislative Committee we have heretofore expressed our approval of H.R. 6836, relating to the regulation of motor traffic, and have submitted certain suggestions intended to improve it. The bill now submitted by the Co-ordinator differs slightly from the Rayburn bill. However, the changes suggested by the Co-ordinator are in line with our suggestions to Chairman Rayburn and we believe still further improve that bill. We are also unanimous in recommending the third class of legislation, with the exception that Chairman Lee and Commissioner McManamy do not concur in any amendment relating to the fourth section."

"While we are required to comment only on the recommendations of the Co-ordinator, we cannot refrain from commending to your careful consideration his excellent discussion of the many situations associated with his recommendations. His analysis of the contemporary situation is illuminating."

Mr. Eastman concludes his report with the following:

General Summary

Since 1920 the transportation facilities of the country have expanded enormously. Capital about equal in amount of the total invested in the railroads in that year went, in one way or another, into the provision of other means of transportation, and the railroads increased their own investment by nearly one-third. The natural result has been a bitter struggle for traffic, not only between the various forms of transportation, but within each subdivision or group, and this struggle has been intensified by the depression. This situation, which has been continually growing more acute, not only imperils the financial stability of the national transportation system, but it threatens the wages and working conditions of labor, and it creates a demoralization in rates and charges which in the long run is a menace to commerce and industry.

The view that something must be done about this situation has continually gained in strength, and is now commonly held. There are, however, two schools of thought. The railroads are subject to a very comprehensive system of public regulation, which is the product of years of experience and controversy. The other transportation agencies are regulated much less thoroughly, and to a considerable extent not at all by the federal government. It seems to be agreed that this inequality should be corrected. Some wish it corrected by imposing more com-

prehensive regulation upon the other forms of transportation. Others believe that the thing to do is to let down the bars of railroad regulation.

It is because of this diversity of view that it has been deemed wise to combine in this report a consideration both of the proposals for regulating the other transportation agencies and of the specific proposals of the railroads for relaxing their own regulation, including those which they condition upon the assumption that no further regulation is to be imposed upon the other agencies. Apart from these conditional proposals, the striking thing about the suggestions of the railroads is that so many of them are relatively unimportant or even trivial. After all that has been said about the extent to which the railroads are hamstrung and fettered by public regulation, this circumstance is very significant. Their proposals leave untouched most of the vital parts of the scheme of regulation, including such matters as control over securities, the construction of new lines, the abandonment of old lines, consolidations and acquisitions of control, service, accounting, and most matters of safety. The regulation of rates and charges is left largely intact, even when the conditional proposals are taken into account, and these are plainly offered for tactical reasons.

It is believed that the experience of the past, not only with the railroads but with all industry, and not only in this country but in other parts of the world, shows which course to take. We relied in the early days of railroading upon free competition as the means of public protection, and the result was bankrupt and unsafe railroads, bad labor conditions, flagrant favoritism in rates with the benefit going to the big shipper and the big community, and an uncertainty and instability which were demoralizing to industry in general. Competition was not universal, for the railroads enjoyed a monopoly at many of the smaller places. But public regulation was imposed quite as much to cure the ills of unrestrained competition as to curb the exactions of monopoly. Of late the country has begun to discover that competition can also require restraint in industries which were not supposed to be affected, like transportation, with the public interest.

It has become evident that the entire transportation industry, including the other agencies as well as the railroads, is in need of the guiding hand of Government control if a threatening chaos is to be transformed into order; and this is the conclusion that has been reached quite generally in other countries. The object of such control is not the protection of the railroads only, but the proper protection of every form of transportation. They all have their parts to play, for each one of them can do certain things better than any other agency. The problem is to find their appropriate functions, protect them in the performance of such functions, prevent wasteful duplication of service without eliminating such competition as is economically sound, and promote a system of stable rates which will reflect the lowest costs of good service but afford the necessary foundation for credit. It is too much to expect that all of the present facilities of transportation in each group can survive, for there are many which are now without economic justification, but out of the present confusion and waste a sound and well co-ordinated national system of transportation can be built.

The agency to achieve this result is believed to be the Interstate Commerce Commission. If transportation is to be co-ordinated, regulation must be co-ordinated, and the Commission is the natural and appropriate agency for that purpose. It has been in existence for nearly half a century, and few governmental bodies have stood the test of time as well. No other agency has the organization or the necessary experience. The regulation proposed will have the best chance for success in its hands.

The first report (dated January 20) of the Federal Co-ordinator of Transportation under Section 13 of the Emergency Railroad Transportation Act, 1933, dealt with the question:

- I. Is there need for a radical or major change in the organization, conduct, and regulation of the railroad industry which can be accomplished by Federal legislation?

Certain other questions, then under study, were listed and it was stated that they would be discussed in further reports. This report deals with two of these questions, namely:

- II. Is there need for federal legislation to regulate other transportation agencies, and to promote the proper co-ordination of all means of transport?
- III. Is there need for amendments to federal statutes to improve details of the present system of regulating the railroads?

The necessary research has been in charge of Dr. C. S. Morgan, the economist of the Interstate Commerce Commission, assisted by the following members of the Co-ordinator's staff: F. R. Bell, P. A. Conway, R. Eldridge, R. E. Freer, R. Lyon, S. A. Oyen, F. A. Rasch, W. Tufts and H. C. Wilson. Much assistance has also been received from various departments of

the Commission, from the United States Shipping Board Bureau, and from the state commissions. Dr. Morgan has played a large part in the writing of this report, and in the final preparation of the bills and appendixes, and Mr. Wilson and Mr. Freer have been of much assistance in the latter work.

Following is an abstract of the major portion of the report, which in all consists of 180 mimeographed pages, in addition to several appendices:

Recent Transportation Changes

The past 15 years have been a period of great change, development and adjustment in transportation, not only in this country but all over the world. During this period an enormous amount of capital went into new transportation facilities in the United States. After making due allowance for facilities used in purely local transportation or which are otherwise not competitive with established agencies of transportation, it appears conservative to estimate that the increase in transportation facilities between 1920 and 1932 represented a capital outlay of not less than 25 billions of dollars. Such an increase has necessarily had far-reaching effects on the relations of transportation agencies. These effects are accentuated by the fact that our population has been increasing at a lessening rate. The physical expansion of the nation has also been largely accomplished; in fact, contraction of agricultural production is a part of our present national policy. In *Coordination of Motor Transportation*, 162, I. C. C. 263, it was indicated that the proportion of truck to rail traffic, 5.8 per cent in 1929, would show an increase as the result of further developments in trucking and the relatively greater effect of the depression on the railroads than on the trucks. This prediction is borne out by an estimate, which is given below. In the year 1932, the distribution of traffic, in short tons and ton-miles, was approximately as follows:

	Tons (000)	Per Cent of Total	Ton-Miles (000)	Per Cent of Total
Steam railroads	678,854	53.9	235,308,521	73.9
Great Lakes	39,544	3.1	24,733,878	7.8
Pipe lines (petroleum)	80,029	6.3	19,600,000	6.2
Inter-city trucks	299,768	23.8	29,976,800	9.4
Inland waterways	151,276	12.0	7,904,910	2.5
Electric railways and airplanes	11,661	0.9	583,260	0.2
Total	100.0			

Coastwise traffic in 1932 aggregated 94,434,000 short tons and inter-coastal, 6,427,000 tons. In 1929 the railroads originated 1,419,383,000 tons of traffic; bulk traffic on the Great Lakes has also fallen off sharply. A general recovery of business conditions will substantially change the ratios given above.

Inequality in Regulation

All of these classes of carriers compete with each other, and the competition is continually increasing in bitterness and intensity. This brings inequality in regulation to the forefront. The presence and use of these differing forms of transportation raises the question whether destructive competition should be lessened and constructive coordination be increased. Stated more concretely, the question is whether it is sound public policy to encourage duplication of facilities and warfare all along the line, or to find the work which each form of transportation can do best and endeavor accordingly to build up a national transportation system in which the various agencies will function with more regard to correlation and less to competition and with a minimum of waste.

The Subsidy Question. The right of way which motor vehicles use, unlike that used by the railroads, is provided and maintained out of public funds. A similar situation exists as to water and air carriers, to the extent that they use waterways, harbors, port facilities, and aids to navigation, or landing fields, beacons, and the like, provided and maintained at public expense. The question arises whether and to what extent, by reason of these conditions, and giving due consideration to taxation and other payments into the public treasury, certain forms of transportation are receiving an actual or virtual public subsidy which gives them a substantial advantage over competing forms of transportation which cannot be justified on sound grounds of public policy. To the extent that this is found to be the situation, the further question arises as to how it can and should be corrected. These questions have required so much intensive research that the results are not yet ready for publication.

Public Safety and Convenience. The states impose numerous regulations for the protection of the public safety and convenience in the use of the highways. So far as may be necessary for the protection of interstate commerce, the federal government has the power to impose similar regulations and even to over-ride those which the states impose, but as yet has done nothing of this kind. The question is whether there is need for the federal government to enter this field. This will also be considered in the subsequent report.

Labor Conditions. Hours of service of certain classes of railroad employees are regulated by the federal government and

a procedure for collective bargaining and mediation is also prescribed. There is some state regulation affecting railroad labor conditions. Except so far as certain states restrict hours of service of motor vehicle employees, there was no corresponding regulation of labor conditions for the other transportation agencies, until the establishment of codes under the National Recovery Administration. The question is whether further federal legislation is necessary for the protection of the public safety and of labor in the transportation industry. The results of the research into this matter will be presented in subsequent reports.

It is clear that no regulation or restrictions should be imposed upon any form of transportation merely for the purpose of benefiting some other form of transportation. On the other hand, whatever the public interest may require ought to be done no matter how it may affect private interests. In the final analysis, the public interest requires a national transportation system so administered and controlled that service can be furnished at the lowest possible charges consistent with adequate maintenance and ability to provide the modern facilities and the character of service which the best interests of commerce and industry demand.

The Water Transport Industry

Conditions in the water carrier industry are described in detail, including coastwise and intercoastal operations and those on the Great Lakes and inland waterways. While there has been some public regulation of water carriers, it has been incomplete and ineffective. The routes are over-tonnaged, there is much cut-throat competition, the carriers have for some time been in poor financial condition, much of their equipment is old, and they lack funds for replacements. Sentiment in favor of greater public regulation has grown within the industry and among those whom it serves.

Public Regulation. Until recent years public opinion has been strongly opposed to regulation of port-to-port rates. With the exception noted below, the Interstate Commerce Commission has never been given authority to regulate such rates, although it has rather complete authority to establish through routes and connections between the railroads and water carriers and to prescribe and regulate joint rates thereover. This authority, however, was given to it largely for the benefit of the water lines, in order that they might be able to handle traffic to and from interior points which the hostility of the railroads might otherwise, in many instances, make it impossible for them to serve. Where such joint rates are established, also, the Commission gains authority to regulate the accounting of the water carriers and to require reports from them.

The exception came about through the passage of the Panama Canal Act of 1913. Theretofore the railroads had owned or controlled quite a number of steamship lines, chiefly in the coastwise and Great Lakes trades; but by the Panama Canal Act they were prohibited from owning or controlling any water carrier operating through the Panama canal or elsewhere with which they competed or might compete for traffic. The Commission, however, was given authority to extend the time during which they might continue to operate such water service. If such an extension were made, it was provided that the rates of the water carrier in question should be subject to regulation by the Commission to the same extent as the rates of the controlling railroad.

Results of Policy. Comments on the railroad situation often heard might lead to an assumption that the relative freedom from public regulation which the water carriers have enjoyed would have brought to them a corresponding degree of prosperity. This assumption might more readily be entertained because of the benefits conferred upon shipping by the construction of the Panama canal and other improvements of our inland and coastal waterways and harbors, and of government encouragement in other forms. The fact is, however, that the water carrier industry is now, and for some time has been far from prosperous. While better business conditions will increase present traffic, and while some of the fortuitous effects of the World War are diminishing, there is reason to believe that the troubles of this industry are deepseated and require treatment of a basic character. At the bottom of the troubles lies too much and uncontrolled competition. Within the industry itself competition has been particularly severe. Self-regulation through conference agreements, while beneficial in many respects, has not been a solution. Like the railroads, the water carriers have also suffered from motor vehicle competition. Finally, the water carriers have suffered from railroad competition.

The demoralization which the water carrier industry has suffered, and the increasing demoralization which threatens, have caused many in the industry to change their former attitude of opposition to one of willingness to accept or even to seek effec-

tive public regulation. Shippers show a similar shift in opinion. They recognize that regulation would doubtless increase somewhat the average level of rates over a period of years, but many attach more importance to stability and adherence to published rates than to the fugitive advantages over their competitors which they may derive from rate cuts. Certain sections of the country would welcome regulation as a possible means of restoring a lost balance in regional competition.

Carrier and shipper attitudes are set forth in some detail in Appendix A, Part 2. The information there shown was obtained largely by means of three inquiries, S. R. 3, sent to water lines, S. R. 6, sent to a co-operating committee of shippers by water, and a general press release which invited the filing of briefs by any individual or group interested in transportation questions. Of the 220 water carriers who responded to S. R. 3, 67 were in favor of effective federal regulation, 5 were in favor of regulation but added certain qualifications, 52 were opposed, and 96 made no reply to this particular question. As previously indicated, the negative responses were mostly from the contract and private operators. Of the 536 traffic managers of industry who replied to S. R. 6, 356 favored more effective federal regulation, 99 opposed such regulation, and 81 made no reply on this point. Of some 338 persons, corporations or associations who filed well-considered briefs or statements in response to the press release, 298 favored federal regulation and 40 opposed it. A recent poll taken by the United States Chamber of Commerce of its member organizations indicates about a six to one preference for more adequate regulation of water transportation.

The Need for Regulation. The present chaotic conditions in the water carrier industry produce results which plainly are contrary to the public interest. In the first place, they produce an instability of rates which is harmful to the conduct of commerce and industry. In the second place, and even more important, chaotic conditions produce financial demoralization, impair credit, and tend to prevent the industry from keeping equipment and service in line with the best modern standards. In the third place, the absence of effective regulation stands in the way of the co-ordination between all forms of transportation which it is so desirable to bring about. The evidence justifies the conclusion that regulation is necessary in the public interest, and that the essentials are

1. *Control over the amount of competitive service afforded.* Just as it has become necessary to guard against a production in industry and agriculture which is greatly in advance of consumers' ability to buy or consume, and against unneeded construction of new railroad lines, so it is necessary to guard against similar excess in ship tonnage on trade routes.

2. *Control over minimum charges.* The need for such control was discovered long ago in the case of the railroads, and more recently in general industry, as evidenced by the National Recovery Administration codes. There is no other adequate means where competition is present, of preventing demoralization, both in rates and in wages and labor conditions.

3. *Control over operations of contract and private carriers.* The essential service is common carrier service, regularly maintained and open to all on equal terms. Without undertaking to eliminate contract or private carriage, those who engage in it should at least be prevented from trespassing unfairly on the business of the common carriers whose service obligations they are not always willing to assume.

4. *Adherence to published schedules and prevention of unjust discrimination.* These were long ago found essential in the railroad industry, and are essential to the stability which commerce and industry require.

5. *Co-ordination with other forms of transportation.* Each form of transportation—rail, water, highway, pipe lines, and air—can perform certain service more cheaply or more efficiently than can any of the others. It should be protected in such service against destructive competition by the others, and at the same time provision should be made for easy interchange and the establishment of through routes and joint rates where such co-ordination is desirable.

These are the essentials. There are, of course, certain phases of regulation which are necessary in order that the essentials may be accomplished, such as control over accounting, access to records, provision for reports, and the like.

There is much bulk traffic, which the ocean or Great Lakes common carriers generally do not undertake to handle. As to such traffic, present practices of the contract carriers need not be seriously disturbed. The regulation of contract carriers of full or part cargo lots, to the end that their rates shall not be depressed to levels which threaten the common carrier service which the general public interest requires, violates no constitutional limitation, so long as it is confined to that end. Likewise, it is lawful to prohibit the private carrier from transporting the goods of others, to the end that the common and contract carriers may be protected from unfair and destructive competition.

Practical difficulties will no doubt be encountered. The control exercised over the common and contract carriers will no

doubt mean the stabilization of rates on a somewhat higher level than has obtained, on the average, in recent years. This should be frankly recognized. It may furnish an incentive for greater use by large industries of their own shipping facilities. On the other hand, the prohibition against industrially owned boats carrying the traffic of others will have a contrary effect. An important probable result is improved relations and a greater degree of correlation between the rail and water carriers.

The Motor Transport Industry

Conditions in the motor carrier industry are also described at length. It is shown that trucking is disorganized and much of it is in an economically unsound condition. The small scale of operations, the ease of entering the business, and the presence of three highly competitive types of operators (the common carrier, the contract carrier, and the private carrier) are the reasons. Many of the truckers are poorly trained and inadequately financed, and some are irresponsible. Too often rates have been demoralized by operators with little knowledge of costs or driven by sheer financial necessity to quote rates known to be unremunerative. The financial depression has drawn many unemployed into the business, has made many second-hand trucks available at low prices, and has demoralized labor conditions. The bus industry is better organized, but is far from prosperous.

The motor trucks fill a need for expeditious, frequent, and specialized short-haul service which the railroads were unable to meet. With the improvement of the trucks and the tremendous expansion of hard-surface highways, the number of operators and the range of their operations greatly increased. They were helped by the railroad rate structure, which recognizes value as well as cost of service, with the result that the higher-valued commodities and the shorter hauls pay higher rates, relatively, than the lower-valued commodities and the longer hauls. If fixed on a strict cost basis, it is declared probable that many of the rates would be higher than they now are and many others would be lower, some of them much lower. The country has in general approved this method of making railroad rates, believing that it tended to place the burden where it could best be borne, and much the same method has been followed all over the world. However, it favored truck competition, since it made the traffic vulnerable on which the relatively higher rates are charged.

The railroad response to this competition was tardy, but the tendency toward drastic and widespread reductions in railroad rates is now so pronounced that it is causing serious concern to the truckers. In making these reductions, the railroads proceed on the theory that any rates necessary to regain traffic can be justified, if they more than cover "out-of-pocket" expense. Having no non-competitive traffic to furnish reserve strength, the trucks cannot apply that theory as fully or as effectively as the railroads, and the same is true of the buses and the water lines.

Motor Truck Ton-Miles Estimated at 12.7 Per Cent of Rail Traffic

From the standpoint of cost of service, the great advantage of the trucks is in the much lower cost of terminal operations. The great advantage of the railroads is in line-haul cost, more particularly when the traffic loads heavily and moves in volume. It follows that net advantage for the trucks is ordinarily to be found in the shorter hauls and disappears when a certain varying limit is reached. This subject of comparative costs is being thoroughly developed in studies which the Co-ordinator's Section of Transportation Service now has well under way. Apart from cost, the principal disadvantages of the trucks are to be found in the lack of known and stable rates and dependable service and in lesser financial responsibility, although there has been considerable improvement of late in the latter respects. The situation may be summarized by saying that the truck has distinctive cost and service advantages for many classes of traffic within a considerable zone; that it also endeavors, sporadically

or otherwise, to reach beyond this zone; and that the railroads, once indifferent to the loss of short haul traffic, are fighting to hold or regain both it and the moderate and long distance traffic for which trucks are now bidding.

The aggregate volume of truck traffic can only be estimated and with difficulty, and much of it has been developed by the trucks. Estimates in the *Co-ordination Case, supra*, placed the volume of truck traffic in 1929 at 18.3 per cent of rail traffic in terms of tons originated, and at 5.8 per cent in terms of ton-miles. An estimate of the aggregate volume of motor truck traffic handled outside the strictly local haulage area indicates that in 1932 truck traffic was about 44 per cent of rail in terms of tons originated, and 12.7 per cent in terms of ton-miles. This comparison understates, however, the influence of the truck on the rail and water carriers, as the latter are suffering severe losses in revenue on much of the traffic which they carry, owing to reductions of rates made to keep or regain traffic. There is also the fact that on the whole truck traffic is of the higher revenue-producing types. All told, the losses to rail and water carriers probably amount to several hundred millions of revenue per year.

Against the diversions mentioned is to be set a very considerable volume of traffic which the railroads derive, directly or indirectly, from the automotive industry. The greater part of this traffic, however, has no relation to truck or bus operations, as such, and the railroads which have gained the automotive traffic are not always the ones which have felt motor competition most severely.

Co-ordination between the railroads and the motor vehicles, the report says, has not gone very far, but is increasing. Many of the railroads have gone extensively, through subsidiaries, into truck and bus operation, and are using the new means of service as a substitute for or to supplement their rail service. The opportunities for desirable co-ordination are said to be very great.

The report contains a statement in regard to experience in other parts of the world, which is amplified in an appendix. The situation is much the same as here. The present tendency is in two directions. The railroads have discovered that drastic regulation of the trucks is not a cure for their own troubles, and are turning their attention to improvements in their own equipment and service, and to the readjustment of their rates. This movement has gone farther in some countries than here. On the other hand, the public authorities are directing their attention to the co-ordination of all of the transportation agencies.

Intercity Buses

While intercity buses do a large volume of business, the railroads have suffered much more from the private automobile. Using certain estimates compiled by the trade, it was found in the *Co-ordination Case*, that intercity buses performed 12.3 per cent as much service, measured in passenger-miles, as did the railroads in 1926, and 26.3 per cent as much in 1930. Later estimates from the same source give 30.7 and 37.1 per cent as the ratios for 1931 and 1932, respectively. The Interstate Commerce Commission estimated in the same case, that only about 20 to 30 per cent of the loss in rail passenger travel has been due to the bus or similar for-hire vehicles.

In this field, as well as in trucking, the competition of the operators themselves was, until recently, mainly responsible for demoralized conditions. Lacking federal co-operation, the states were powerless to cope with an unhealthy competitive situation which was of only short-run advantage to the traveling public. Until recently, the railroads made few efforts to improve their service; the tendency was to abandon many local trains but to continue through trains on about the same frequency as before, and to maintain the rates. Traffic continued to leave the rails to such an alarming extent that determined efforts are now being made to improve the service by developing radically new equipment and cutting rates, in many sections drastically. The development of new rail equipment is still in the experimental stage, but is progressing rapidly. What the traffic effects will be remains to be seen, but the prospects seem promising.

At a time when their own costs were rising because of the labor restrictions of the NRA Code, these recent fare reductions by the railroads have greatly alarmed the bus operators. Ultimately an investigation by the Commission is likely to be necessary. The railroads say that because of the mail and express business, and for other reasons, they are obliged to continue passenger operations, and if they can increase the revenues of these trains by fare cutting, they gain to that extent. They

disclaim any onslaught on the buses, stating that the private automobile is a much more serious factor. As the buses have also regarded the private automobile as their chief competitor, the effect of the reductions on their own revenues is likely to be serious. The fare cuts are still regarded by the railroads as experimental, and it remains to be seen whether they will increase train revenues.

As in the field of freight transportation, there are many opportunities for effective co-ordination which have not yet been explored.

An Over-Supply of Transportation

In the past ten or fifteen years we have followed, unconsciously for the most part, a policy of encouraging an over-supply of transportation service. In consequence, transportation charges have been lowered for many shippers, but these savings are in part only apparent, as diversions of traffic have played a part in holding non-competitive rail rates on a high level, and the costs borne by the public as a whole may, in the aggregate, be insufficiently met by the payments which the shippers make. Moreover, there have been large losses in capital returns.

The public has also a decided interest in an orderly functioning of the entire transportation mechanism. While some shippers gain temporary advantage from unstable and unpublished rates, the greater present good and the long-run good of all require that the transportation factor in the cost of doing business be known and predictable. The truck has changed a situation in which substantially all these requirements were met to one of widespread uncertainty, instability, distrust among shippers, and undue discrimination and prejudice, particularly in favor of the large shipper. Trucks have done much to break down a system of rate control which was subject to deliberate adjustment to changed conditions, but a system whose very liberateness and openness were in fact substantial virtues.

Although improvement has occurred, there still is complaint against the failure of the truck and bus industries to measure up in all respects to the standards of responsibility expected of a public servant. A broader aspect of responsibility also deserves mention. This relates to the maintenance of truck or bus service on which the shipper or traveler has come, perhaps entirely, to depend. Certainly no responsibility is felt by the motor transport industry today to maintain unprofitable or relatively unprofitable service, such as the railroads have maintained, frequently voluntarily, although sometimes by order of public authorities. Truck and bus operators tend commonly to concentrate their efforts on the profitable avenues of traffic. Finally, so long certainly as private capital is the mainstay of the transportation system, the public interest requires conditions which will enable the carriers to maintain good credit. Good equipment, good facilities, and good service cannot be maintained indefinitely without financial stability.

Need for Regulation. There are some who think that the thing to do is to let down the bars and allow the competitors to fight it out to the finish. This would, of course, require practical abandonment of railroad regulation, leaving redress of grievances to the courts. The eventual result might be a kind of co-ordinated system of transportation, achieved through survival of the fittest, but the greater competitive strength of the railroads would be likely to distort the results.

On the other hand, a partial and incomplete system of regulation such as we have had, will not work. The phase through which transportation has been passing in the last decade and a half was doubtless inevitable, for it is difficult to regulate new forms of transportation until they have passed the experimental stage. But the time has arrived for effective control. There is the same need for bringing some degree of order out of chaos as there was in 1887, when federal regulation of railroads became clearly necessary. Competition between the different forms of transportation will continue to have an important part to play, but it must be held within reasonable limits and kept from assuming destructive and wasteful forms.

There is little disagreement as to the need for federal regulation of the interstate bus industry. The National Association of Motor Bus Operators objects, however, to the bus provisions in the Rayburn bill, mainly for the reason that it feels that the self-regulation under government surveillance which is being undertaken under the NRA Code, adopted in November, 1933, should be given an opportunity to show what it can accomplish before other federal regulation is tried, and because of its further belief that if there is to be such regulation, it should be in a separate act.

With respect to truck regulation there are, of course, considerable differences of opinion, both as to the desirability of any federal regulation at this time and as to the scope and form which it should take. The Rayburn bill, H.R. 6836, now before Congress, was drawn by the Committee on Legislation of the National Association of Railroad and Public Utilities Commiss-

sioners, and derives in turn from a bill largely worked out by that association in co-operation with a committee of the Association of Railway Executives, representing also the electric lines, and a committee appointed by the American Highway Freight Association, which has since been merged into American Highway Trucking Associations, Inc. The latter organization appeared in opposition to the Rayburn bill, principally on the ground that the Trucking Code, which became effective on February 26, 1934, will serve immediate purposes and furnish information and experience from which the need and form of permanent federal legislation can best be determined.

Returns to the Co-ordinator's press release of November 4, 1933, brought 31 replies from the trucking industry. Of these, however, 21 were from local cartage companies, which unanimously favored regulation. Three intercity operators were opposed and three of seven motor or related associations took the same position. Of a total of some 401 well-considered replies from persons, companies, or organizations, 367 were for federal regulation of motor carriers at this time and 34, or about 8 per cent, were against. Some 316 would apply such regulation to contract as well as common carriers, and 72 would also extend it to the private operator. A total of 101 favor regulation comparable in kind to that to which the railroads are subject, or at least such regulation of rates and service. Some 31 would limit regulation to safety matters or to rates made for co-ordination purposes. The report of the Joint Committee of Railroads and Highway Users, made on January 30, 1933, is also significant. In a referendum conducted by the Chamber of Commerce of the United States in September and October, 1933, a very large majority of the votes cast were in favor of requiring the common and contract carrier to obtain permits to operate; to file, post, and adhere to rates that are just, reasonable, and non-discriminatory; to provide adequate financial responsibility for the public and patrons; and to observe reasonable hours of service for drivers. The National Industrial Traffic League opposes any federal regulation that goes beyond the keeping of records, the filing of reports, and joint arrangements for complete service between railroads and trucks.

It is reasonable to conclude that there is a rather general demand for federal regulation of motor carriers, although views differ as to how far control of truck rates should go and as to numerous details of regulation.

Practicability of Federal Regulation. The most serious argument against federal regulation is that, to be effective, it would require a large, costly, and bureaucratic establishment with a small army of agents and investigators, the remedy being worse than the disease. The argument is advanced with respect to trucks only, for the regulation of interstate bus operation is, as the National Association of Motor Bus Operators has stated, a "relatively simple" matter. It was the argument which gave pause to the Commission in the *Co-ordination Case*, when it recommended regulation of the bus, but only insurance and provision for obtaining full information in the case of truck operations. At the time, this limited recommendation was appropriate and should have been followed, but the need for action is more urgent now.

Some light is thrown on the practicability of federal regulation of the truck by the experience of the states. Foremost is the fact that the states have continued to expand and strengthen their regulatory laws and that, out of their close contact with the problem, they are pressing strongly for comprehensive federal regulation. Even organizations which are opposed to thoroughgoing regulation, such as the National Automobile Chamber of Commerce, the National Highway Users Conference, and the National Industrial Traffic League, believe in certain forms of regulation which, as a matter of fact, involve many of the difficulties urged against more drastic forms. The Trucking Code is in itself a concession by the industry that a very considerable degree of regulation under federal auspices is both practicable and necessary, and it is significant that it was upon insistence by the industry that some measure of control over rates was provided for in this Code.

Only 203,000 Trucks To Regulate?

Recently gathered statistics indicate that the number of trucks engaged in for-hire operation is considerably less than commonly supposed. Early estimates put the number as high as 600,000, or even higher. A study made by the United States Bureau of Public Roads, modified as explained in Appendix D, places the number of contract trucks in 1932 at 162,046, and the number of common carrier trucks at 40,512. Assuming these figures to be approximately accurate, there were some 203,000 trucks subject to regulation, out of a total of 3,240,928. The number of trucks per operator, estimated as indicated in the same Appendix, was 1.5 for contract carriers and approximately 4 for common carriers. These averages indicate about 107,000 contract carriers and slightly over 10,000 common carriers. Federal regulation would tend to establish more uniform and clear-cut classifications

of operators, which would vary the proportions given above. The result doubtless would be a relatively larger number of common or contract carriers. In considering the number of contract operators, it is to be borne in mind that they would be subjected to much less detailed regulation than the common carriers.

It may be asked whether it is worth while to regulate the operations of so small a portion of the trucks. There is considerable confusion on this point. First of all, between 800,000 and 900,000 of the trucks are farm-owned and used, for the most part, in farm operations. An even larger number of trucks are used only in local operations, such as light deliveries of dry goods and groceries and heavy deliveries of coal and other fuels, building materials, etc. Only the larger industries are likely to engage in trucking beyond a rather limited radius. It is also to be noted that privately operated trucks have a much lower annual mileage than for-hire trucks, and tend to run light or partially loaded to a greater degree. Similarly, common carrier trucks make more mileage per year and have a better average load factor than contract trucks. All of these considerations lead to the conclusion that an important part of all except short-haul motor transportation is conducted on a for-hire basis and, therefore, is subject to regulation.

There will be troublesome problems in the separation of interstate and intrastate operations. The exact number is not known and cannot be estimated with any degree of accuracy. However, it is concluded, on the basis of studies appearing elsewhere, that 20 per cent of all truck traffic measured in ton-miles (other than strictly urban traffic) is interstate. The proportion of interstate for-hire traffic is undoubtedly higher.

It would be foolish to deny that serious practical difficulties will be encountered in federal regulation of the trucks; but it would be equally foolish to believe that they are insurmountable. With respect to these matters, some general observations may be made:

1. It is a mistake to assume that there will be any general desire or attempt to violate or evade the law. To an important degree regulatory laws of this character are self-enforcing.

2. Those in the industry who will wish to observe the law can be depended upon to help in its enforcement by supplying information in regard to violations. In the case of the trucks, information as to violations or evasions will come, not only from the industry itself and from shippers who use it, but also from competing transportation agencies, such as the railroads and the water lines.

3. The states are ready and anxious to co-operate in federal regulation, the lack of which has greatly hampered their own regulation. Any federal regulatory Act should provide for the full utilization of state co-operation and in this way greatly reduce the force of federal agents and investigators which would otherwise be necessary.

4. In public regulation of any industry, it is unnecessary to provide for complete surveillance. What is necessary is to have a supervisory force which can make test checks here and there at unanticipated times, and to impose prompt and effective penalties when violations or evasions of the law are discovered. In the case of trucks, in addition to the ordinary penalties for violations of law, a very effective remedy through cancellation of certificates or permits will be available.

5. As the units in the industry become larger and better organized and the number of operators decreases, regulation will be simplified.

It was thought by many, prior to the passage of the Elkins Act in 1903 and the Hepburn Act in 1906, that it would be impracticable to secure railroad adherence to published tariffs and to prevent rebates. Well-considered laws coupled with severe penalties, however, accomplished both of these ends in large part. Trucking tariffs will be much less complex than railroad tariffs. Publication and adherence to tariffs will not be a difficult task, so far as the common carriers are concerned. Contract operations will present a more difficult problem, but the tendency, and a most desirable one, under regulation will be for the contract carriers to become common carriers.

In order to establish the true character of the trucking done by private operators, it may be necessary to provide for the registration of their trucks. This could, however, be readily accomplished as a detail of the states' annual licensing of motor vehicles, and in fact could be left wholly in the hands of the states. The problem of preventing private business from engaging in operations for hire will be troublesome, but the fact that intercity private trucking is chiefly by large and responsible industries will simplify the task. Farmer-operated trucks will in effect be exempted. No particular difficulty will be encountered in establishing a proper system of accounts for the motor industry. It will be necessary, of course, to make the system very simple for the smaller operators.

Considerable difficulty is to be expected in connection with the granting of certificates and permits. The information now in the hands of the states and that which is being collected under the auspices of the National Recovery Administration will be a

great aid. The so-called "grandfather" clause in the proposed legislation will simplify matters at the start. The certificates, permits and, if required, registrations will furnish the basis of all administrative action. A definite headquarters will be established for each operator, at which he can be reached at all times for service of notices and orders, the inspection of accounts and records, and the checking up of operations. The fixing of minimum rates, when necessary, for either railroads, trucks, or any other transportation agency is not a simple or an easy duty. That it is necessary and not impracticable in the trucking industry is attested by the fact that provision for such minimum rates has been included at the insistence of the industry, in the Trucking Code. Summing up the situation, federal regulation of the motor transport industry will not be easy, but it is not impracticable. Federal regulation of railroads, when it was first undertaken, was a more formidable task.

Highway and Safety Regulations. The states regulate extensively the length, width, height, and speed of motor vehicles and their maximum gross weights, and require that they be equipped with a variety of safety appliances. Considerable uniformity is found in the requirements with respect to widths, heights, and safety appliances, and a tendency toward greater uniformity as to these matters and as to maximum lengths of vehicles or combinations of vehicles is discernible. The existing lack of uniformity and the character of the restrictions set up by some of the states constitute, in the opinion of some, a serious interference with the free flow of interstate commerce. Federal action is therefore urged. Questions of highway design and highway costs are highly technical. They may better, therefore, be reserved for consideration as a phase of a forthcoming report on the general question of highway costs and their allocation.

The Co-ordinator, in co-operation with the Department of Labor, has also made an extensive study of wages and working conditions in the motor transport industry, largely for the purpose of determining whether motor carriers derive an advantage in their competition with other forms of transportation through requiring excessive hours of labor and paying unduly low wages, and whether, for this reason or from the point of view of public safety and employee welfare, federal regulation is needed. The results of this study will appear in a forthcoming report of the Co-ordinator.

The recommendations of both studies are reflected, to some extent, in the accompanying federal motor carrier bill. It gives the Commission authority to make reasonable requirements with respect to safety of operation and equipment. It also authorizes the Commission to investigate and report on the need for federal regulation of the sizes and weights of motor vehicles used in interstate and foreign operations, and of the qualifications and maximum hours of service of employees, in the case of all motor carriers, including private carriers of property.

Probable Effects of Regulation. It is likely that regulation will somewhat lessen the flexibility of truck operations and set up requirements which small or poorly financed operators will not be able to meet. But it should confer benefits on the trucking industry which will more than compensate for these losses, by promoting a more orderly conduct of the business, lessening irresponsible competition and undue internal strife, encouraging the organization of stronger units, and otherwise enabling the industry to put itself on a sounder and more generally profitable basis. It will also tend to reduce the friction which now exists by reason of conflicting state laws and regulations.

It may be urged that regulation will encourage private trucking and thereby work a serious injury to the for-hire sections of the industry. There is little reason to believe that important injury would result. As the legislation proposed would debar the private operator from transporting freight for hire, unless he submits to the regulation proposed for for-hire operators, his opportunity to fill up outbound loads and to pick up for-hire traffic on return trips would be materially limited. The possibility of private operation will, however, set limits to rates, both for the railroads and for the common carrier and contract trucks, and if these limits are not observed, there will be a material increase in private operation.

While certain shippers will lose the unreasonably low rates and the privilege of driving hard bargains which they have enjoyed, especially of late, all will gain the advantages of fair, known, and stable rates. Public advantage will also result from the opportunities which regulation will create for co-ordinating rail, water, and motor services. It will raise two questions, however, which will require serious consideration.

As already indicated, the railroad rate structure has been influenced to a considerable extent by the value-of-the-service theory. The motor truck is threatening this theory all over the world, for it has provided the truck with one of its best competitive opportunities. Under free and uncontrolled competition, cost of service would inevitably be the controlling factor, and rates would tend to seek that level. The same thing would occur under a plan of co-ordination which aims to utilize each agency for the purpose of securing the lowest possible cost.

The result in either event is likely to compel a far-reaching re-adjustment of the rate structure, if transportation costs prove to be what they are commonly supposed to be. This likely tendency to a radical change in the rate structure might be tempered and controlled under public regulation to an extent impossible under free competition. However, the private truck sets definite limits to any policy of modification, for railroad rates and common carrier or contract truck rates cannot go beyond the mark set by the cost of transportation in trucks privately operated by the shipper.

The second question is how far co-ordination should be accomplished under the auspices of the railroad companies. Beyond question they can use trucks and busses to great advantage to supplement or substitute for their rail service, both at terminals and on the line. Already they are doing this to a very considerable extent, and the movement is plainly one which should be encouraged, for it means both greater efficiency and greater economy in service. Some believe that they should definitely become transportation systems, rather than railroad systems, and assume control over all means of transportation. Others strongly oppose this idea, on the ground that railroad personnel is too prone to work along traditional lines and would use railroad methods poorly adapted to the operation of trucks. While railroads should be permitted to use trucks freely in connection with their rail service, there appears to be no present need for encouraging a movement toward the absorption by them of truck, bus, and water operations.

Regulation by Code Inadequate

The conclusion having been reached that federal regulation of both water and motor carriers is necessary, the report next considers how best such regulation may be accomplished, first considering the codes of fair competition under the National Industrial Recovery Act. There are groups in the industries in question, and some outside, who think that this is the best method, or at least one that should be tried before resorting to any other. Codes for the bus, trucking and shipping (in part) industries have been adopted. It is pointed out that the act and the agencies established thereunder are temporary and dependent upon the continued existence of a national emergency. It is also clear, Mr. Eastman says, that the primary dependence is upon self-regulation by the industries. Supervision and control by the government are contemplated, but when thought is given to the multitude of Codes adopted, many of them complicated, he says, the accuracy of the above statement will hardly be questioned. The situation with respect to regulation of transportation is summarized as follows:

1. The need for such regulation has been accentuated by the existing emergency, but is nevertheless a continuing need which will not disappear with the emergency. Code regulation may become permanent, but it is still wholly experimental.

2. Regulation is needed as a matter of industrial self-interest, but is also needed in the interest of other transportation agencies, and in the general public interest.

3. Proper co-ordination of all transportation agencies is of fundamental importance, and it is therefore necessary that their regulation be co-ordinated. It would be difficult to co-ordinate code regulation with this existing system of regulation.

4. An essential part of transportation regulation is control over rates and charges. Price-fixing through codes is an experimental and debatable procedure. Moreover, price-fixing for an industry which sells service is quite a different thing from price-fixing for a manufacturing industry.

5. Experience has shown that public regulation must be administered by a permanent, independent, and non-political body having a continuing and dependable policy, and through definite statutory provisions which register the will of Congress. This body must not be subject to sudden political reorganizations; it must act in controverted matters on a record openly and publicly made, and state the reasons for its action; and, apart from statutory directions, it must be as removed from influence by the President, Congress, or any political agency as the Supreme Court itself.

Co-Ordinated Regulation By I. C. C. Recommended

The theoretical arguments in favor of a single commission are very strong. Under a system of separate commissions, each would tend to become a partisan of its particular form of transportation, and inconsistent policies would almost certainly develop. Nor could policies be reconciled and harmonized by some central agency without making it the ultimate regulating force.

The Interstate Commerce Commission is the natural and logical body to undertake unified regulation of all forms of transportation. The objections which are made to such a plan are practical rather than theoretical. They are:

1. *That the Commission is now overloaded and could not perform additional duties efficiently.* The duties of the Commission are now lighter than they have heretofore been. The peak was reached soon after the return of the railroads from federal control and the passage of the Transportation Act, 1920. Since 1926, however, the tide has been receding. The guaranty settlements are now practically a thing of the past, recapture has been repealed, basic valuations have been completed, there is no congestion of traffic requiring service orders, and the peak in rate complaints has gone by, so that the docket has reached more nearly normal proportions. Moreover, the Commission is now well organized for the handling of security issues, certificates, acquisitions of control, etc. In addition, an Act was passed at the last session of Congress which gave the Commission certain power to delegate work, not only to divisions of three, but to single members and even to special boards of employees. Moreover, it is proposed, in connection with the regulation of motor carriers herein recommended, to utilize the services of state commissions or boards to a very considerable extent.

2. *That the Commission is "railroad-minded", and hence incapable of dealing wisely and effectively with the problems of other forms of transportation.* To remedy this assumed disability, it is suggested that the Commission be reorganized, so that members may be appointed who have had extensive experience with the operation of water and motor carriers. This suggestion is based on a common but superficial thought that public regulation requires commissioners who have had actual experience with the operation of the companies to be regulated.

Put Experts "on Tap, Not on Top"

The fact is that such experience is generally specialized. An operating officer of a railroad usually knows very little about rates, and a traffic officer very little about operation. Neither one is likely to know much of anything about accounting or finance or law. Regulation necessarily embraces a multitude of matters, and men of practical experience in all or any large part of these can with difficulty be found, and if found are usually not available. The opposing parties have full opportunity to present the results of practical experience when cases are heard. Commissioners should be chosen for their ability to grasp new questions readily and to assimilate and appraise evidence quickly, and they should have at their command first-class expert assistance in every branch of their work. They should not be expected to be expert specialists themselves; in fact, it is better that they should not be. The experts should be on tap, not on top.

If given jurisdiction over waters and motor carriers, the Commission should most certainly create new departments in its organization equipped with well-qualified men who have had wide practical experience with such carriers. However, there is little warrant for a belief that the Commission has been unduly favorable to the railroads, as compared with water carriers. Certainly the railroads entertain no such thought.

3. *That the Commission would base the charges of the other forms of transportation on the railroad rates, without proper consideration of the special conditions surrounding transportation by these other agencies.* Undoubtedly such special conditions should be largely controlling. The plan, for example, followed in certain state statutes of requiring motor trucks to charge railroad rates, or a certain percentage over or under such rates, is not sound. If the operation of all of these forms of transportation is to be co-ordinated with real benefit to the country, the basic rate should normally be determined by the operations of the transportation agency which, in the particular instance, has the lowest costs. The objective, of course, is to provide a complete transportation system for the country which will furnish service at the lowest reasonable cost, utilize all forms of transportation to that end, provide for free interchange and joint service, where desirable, permit competition where it can be carried on without loss or waste, but suppress it where it is not economically justified. It is believed that this can be accomplished through co-ordinated regulation by the Interstate Commerce Commission.

4. *That the procedure of the Commission is too bureaucratic, rigid and cumbersome.* In the course of the Commission's history there has, on the whole, been comparatively little complaint on this score. From the beginning it adopted the practice of hearing complaints at the points most convenient to the complaining parties; it banned formalities and helped small shippers in the presentation of their complaints; it has always had a department for the informal adjustment of grievances; more recently it has developed a procedure under which formal complaints can be prosecuted through the filing of sworn written

statements; it has never enforced its regulations rigidly and constantly allows deviations for good cause shown. In formal, controverted cases, it has based its action on definite records openly and publicly made, and its decisions have contained full statements of the facts. But the results, in comparison with those achieved by similar governmental bodies under looser practice, have amply justified this procedure. It is an essential safeguard against arbitrary or influenced action.

In recent years complaint has developed, on the ground of delay and cumbersome procedure, and it has grown in volume. Much of this complaint has been a natural offspring of the confusion and instability of conditions caused by the lack of adequate regulation of railroad competitors. However, while there have been reasons and excuses, the Commission has not been free from blame. It has recognized the justice of the criticism and is making good progress in removing the cause. By the establishment of well-organized and expert departments having special knowledge of the other transportation agencies, the number of cases on which the Commission must formally pass can be greatly reduced. If also, experience should show the advisability of making some such position as that of the present Co-ordinator a permanent institution, his province should be extended over the entire field of transportation.

The next chapter discusses the two bills which are proposed as new parts of the Interstate Commerce Act, one for the regulation of the water carriers and the other for the regulation of motor carriers. The differences between the latter and the Rayburn bill are noted and explained. The principal provisions are indicated in the report.

Short chapters discuss conditions with respect to the air carriers and the pipe lines, but no recommendations are offered for the present. "It is well, however," the report adds with regard to air transportation, "to record at this time the carefully considered belief that regulation, when undertaken, should be placed in the hands of the Interstate Commerce Commission."

The Proposed Water and Motor Carrier Bills

The Water Carrier Bill. The water carrier bill is intended to meet, so far as possible, the needs hereinbefore indicated. Through the control which it proposes over minimum rates and entrance into and tonnaging of routes, and the clearcut distinctions which it establishes between the three types of water carrier, it aims to stabilize the industry and improve the service. The carriers must publish and adhere to their rates and charges, undue discriminations between shippers will be prohibited, and the basis will be laid for a better co-ordination of water with rail and motor facilities.

The provisions apply to transportation of passengers and property wholly by water from one state or territory to another, or from one point to another in the same territory, whether such transportation be wholly within the United States, or by way of a foreign port or water, or the high seas. The regulatory authority is given power to determine how far operations in interstate commerce within the confines of harbors and the operation of small craft shall be subject to the act.

It is proposed to vest the power of regulation in the Interstate Commerce Commission and to designate the bill as Part II of the Interstate Commerce Act. The Commission's present jurisdiction over water carriers under the present act (which is to become Part I) is not disturbed. Jurisdiction over foreign commerce and over commerce between the United States and its possessions will remain with the Department of Commerce. However, as there is a close relation in some instances between interstate transportation and transportation to and from the ports of other nations, the competition of whose shipping may directly and seriously affect the commerce of the United States, the bill provides that relief, to meet such competition, may be granted to domestic water carriers through relaxation of regulation. Thus, such relief might be necessary in connection with the competition between ships of the United States and those of Canada in the Great Lakes trades.

The Motor Carrier Bill. The motor carrier bill is based largely on the Rayburn bill. Consideration has been given to amendments to the Rayburn bill proposed by the Interstate Commerce Commission, and by the state commission representatives and others who appeared at the hearings held by the House Committee on interstate and foreign commerce. The two bills differ in several important respects. Both propose comprehensive regulation of the common carrier, a much less comprehensive type of regulation of the contract carrier, and no regulation of the private carrier. However, Section 325 of the proposed bill authorizes the Commission to investigate and report to Congress upon the need for federal regulation of the sizes and weights of

all motor vehicles operating in interstate and foreign commerce, and of the qualifications and maximum hours of service of employees, this investigation to cover private as well as for-hire carriers. The Rayburn bill contains no provision respecting these matters except that it provides for regulation of the qualifications and hours of service of the employees of common and contract carriers.

The proposed bill is drawn to become Part III of the Interstate Commerce Act. For convenience, the nature of the other differences from the Rayburn bill will be pointed out in connection with a brief section by section summary.

The remainder of the report is taken up with a discussion of the various proposals of the railroads for relaxation of their regulation. The more important of these are conditioned upon the assumption that no further regulation is imposed upon their competitors, and are said to have been offered for "tactical reasons." No changes are recommended, except in the case of the fourth section and in the case of the present provisions with respect to reparation. These proposals are all analyzed, however, at length and with care. A few other changes in the Interstate Commerce Act are considered, and two of these are recommended.

Section 4 and Reparations

The conclusions with regard to Section 4 are that the section should not be repealed, that the amendments introduced in 1920 may well be eliminated, that the words "under substantially similar circumstances and conditions" should not be reintroduced, and that the section should take the form which it had prior to the 1920 amendments.

It is recommended that no change should be made in the reparations provisions, except that the period of limitation should be reduced to 90 days with respect to all claims for reparation, except those relating to overcharges, for which the period should be one year; and that the same period of one year should attach to the collection of undercharges.

The report says that the Hoch-Smith resolution no longer serves a useful purpose and may well be repealed. Affirmative action was not recommended, however, on several railway proposals—among them the modification of Section 15a and the repeal of the automatic train control law, the Dennis act and the Telegraph act of 1888. The suggestion was made that the railroads might bring the latter act independently to the consideration of Congress, along with a proposed anti-scalping law. Railway proposals for amendment of the provisions regarding interlocking directors and the procedure in uncontested abandonment cases were characterized as "trivial and unnecessary."

Attached to the report are also several voluminous appendixes for consideration and reference by those who desire a detailed presentation of the facts. Owing to their volume, these appendixes are not in the mimeographed edition of the report now issued, except three which present the proposed bills. All will be available, however, when the report is printed.

Report Supports General Ideas of President

Mr. Eastman's recommendations fully support the general ideas on the subject which President Roosevelt has expressed on several occasions, to the effect that he was looking forward to a co-ordination of the regulation of all forms of transportation under a single commission, probably the Interstate Commerce Commission. The President has, however, indicated some uncertainty as to whether such legislation would be attempted at this session of Congress and since the report was issued he has allowed it to go to Congress without any indication so far of intention to urge prompt action to place the policy in effect. The Presi-

dent had earlier indicated a desire for an adjournment of Congress at a fairly early date and only last week a tentative program for the remainder of the session was discussed by Congressional leaders at the White House which contemplated adjournment by May 15 and made no place for transportation legislation. Congress has already got itself into the usual snarl, with many controversial measures pending in addition to the appropriation bills, and the committees that would handle transportation legislation also have several important bills under consideration. While numerous hearings have been held on proposed bus and truck legislation, including the recent hearing on the Rayburn bill, the subject of regulation of water transportation has received less attention and would probably require more hearings. There has also been a suggestion that the Interstate Commerce Commission, although it has taken the position that such legislation is urgently needed, might welcome a year or so of advance work by N. R. A. code authorities in obtaining a registration and classification of bus and truck operators and in clearing up other ground work incident to the filing of minimum rate schedules.

R. C. Fulbright, chairman of the legislative committee of the National Industrial Traffic League, issued a statement opposing the recommendations of the Eastman report, saying, "it is to be hoped the President and Congress will not undertake such broad and fundamental changes without giving to the shipping and consuming public every opportunity to present its views and to measure the effect of such proposals."

Freight Train Radio Tried on New Haven

(Continued from page 376)

on the locomotive are mounted on insulators on the front end and are connected to the transmitter and receiver located in the cab by two-conductor transmission lines. The antennae for the rear end of the train are placed on the two sides of the caboose. The equipment operates from a six-volt storage battery supply and is capable of about 30 hours operation without recharging.

The Westinghouse Company has been experimenting since 1925 with railroad radio systems, the first installation being on the Virginian. Other installations followed in 1927 and 1928. These earlier installations employed a wave length of 125 meters and equipment was comparatively large and expensive. The present equipment is small and is relatively simple and inexpensive. New tubes and intensive research on ultra high frequencies have permitted these new sets to be developed and installed experimentally in actual service.

The new equipment operates on a wave length of five meters and the waves have a tendency to follow the tracks, which is highly desirable from an operating standpoint, and tends to minimize possible interference with other types of radio service. In addition, these short wave lengths are conveniently limited in their travel even on regular service other than on railroads. A large number of transmitters may be operated on the five-meter band without interference with one another as long as they are a few miles apart.

The transmitter is started in operation by the pressing of a button located on the hand microphone. The receivers are kept in continuous operation while in service. The loud speaker provides sufficient signal strength to be heard above the noise of the train.

Odds and Ends . . .

Extraordinary Shipment

The London & North Eastern, in England, recently participated in an unusual transportation job. The old cottage built at Great Ayton by the parents of Captain Cook, explorer of the South Seas, was purchased by the Victorian government for transfer to a site at Melbourne, Australia. For this purpose it was carefully dismantled and the pieces of the cottage, including the bricks, paving stones and original tiles and timbers, were packed in more than 1,000 wooden cases. Every fragment was numbered for re-assembling so that the cottage can be erected again in Australia in the same form that it has had for 200 years in Yorkshire. A special train on the London & North Eastern conveyed the cases to Hull for transfer to the ship which carried them to Melbourne.

A Further Note on Fog Detection

To THE EDITOR:

New York

Your discussion of how to deal with fog, printed in the *Railway Age* of February 17, calls to mind the simple rule which was enforced on the Canada Southern some 40 years ago. Superintendent J. B. Morford, in charge of the Canada Southern, when asked about his instructions to station agents in the matter of fog, replied, "They must report to the dispatcher as soon as it is impossible to see the switches."

This may seem excessively simple, but it is to be remembered that the Canada Southern was a simple railroad, straight and level, and presumably the station in each case was midway of the meeting track, and the switches at the ends of these tracks were equidistant from the station office. It was not necessary to light special lamps as, of course, the switch lamps were regularly lighted, without regard to the presence or absence of fog.

B. R. B.

A Crucial Test for British Watches

Claimed to be the only one of its kind in the world, an ingenious device has been brought into use by the Great Western Railway of Great Britain as a means of testing watches prior to their issuance to train and engine service employees. The device reproduces the various jolts and jars which watches receive in service, such as when a trainman jumps down from a car to the ground. It is composed of a small wooden tray, holding twelve watches, which is fixed at one end while the other is rapidly jerked up and down by means of an electric motor. Every watch is subjected to a fifteen-minute test, during which time it receives 1,200 shocks. If at the end of this time the watch is found to be working correctly, it is the custom of the Great Western to pass it for service. It would seem more appropriate to us, however, if any watch which could survive this severe test were assigned, not to work, but to a long vacation in which to recuperate.

The "Century" a Movie Location

For about a week last month a special section of the New York Central's Twentieth Century Limited was the scene of activities of a moving picture company which has a picture called "Twentieth Century" in production. Probably no railway or individual train has been so completely photographed as the New York Central and the "Century" have now. The scenes photographed extend all the way from Chicago to New York, and pictures have been taken of employees of all ranks and duties, of trains entering and leaving the LaSalle Street station and the Grand Central terminal, of trains moving through the tunnel under Park avenue in New York, of shops and round-houses, and so on. The climax of the movie-making was the trip between Albany and New York. On this occasion engine 5341 was festooned with cameras until it was almost unrecognizable. One of the items of special equipment used was a steel vibration-proof shelf which extended from the right front side of the locomotive and commanded a view not only of the running gear but of the full length of the train. Another was a vibration-proof camera boom extending eight feet from the locomotive's

side, and still another device sustained and protected a camera placed underneath the locomotive to photograph the process of taking on water from track pans.

The Indispensable Mr. Bagshaw

A prophet not without honor even in his own home town is Arthur Bagshaw, station agent of the Pennsylvania at Glenloch, Pa. This fact became a matter of public record when the Pennsylvania decided to make Glenloch a non-agency station and to transfer Mr. Bagshaw to another town. Alarmed residents of Glenloch promptly appeared before the Pennsylvania Public Service Commission to plead for the retention of their hero.

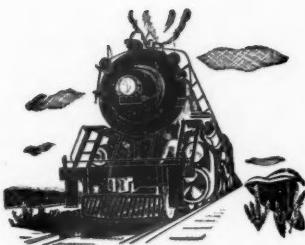
"I do not see how we can get along without Mr. Bagshaw," testified R. H. Reilly, a member of the Glenloch community. In effect, he said that through days of labor and nights of rest, Mr. Bagshaw is the solace of the entire community. He not only performs his duties as station agent in an exemplary fashion, but also runs errands, calls the fire department, awakens the town druggist at night when medicine is required, and on occasion looks after the youngsters when their elders go shopping. It was indicated that even when the citizens of Glenloch do not call upon Mr. Bagshaw for specific services, they enjoy a sense of security because of the mere knowledge that he is there.

Norfolk & Western Issues a Challenge

Candidate for the title of tallest railroad employee is Fred Butterworth, clerk in the car service department of the Norfolk & Western at Roanoke, Va. He is 6 ft. 10 in. tall, and the accompanying illustration shows how he stacks up in height in comparison with T. F. Sheehan, president of the Norfolk & Western Veterans Association, who is 5 ft. 9 in. tall. The



Norfolk & Western Magazine has been unable to find any other employee of the Norfolk & Western who is taller than Mr. Butterworth, and it is now challenging other railways to produce a lengthier employee. If any road has an employee who can exceed 6 ft. 10 in. in altitude without the aid of high-heels, we shall be glad to hear from it.



RETIRE ROAD-CLOGGERS

The demand for speed is making all but the most modern locomotives obsolete.

You can't team up the old, slow drag, motive power with modern high speed Super-Power Locomotives.

Retire the obsolete road-cloggers in favor of new power designed for modern railroading.



NEWS

Passenger Train Pooling in Canada Saves A Million

Railways minister defends plan and foresees an increase in employment

Hon. R. J. Manion, Canada's Minister of Railways, was questioned last week in Parliament at Ottawa regarding the Canadian Pacific-Canadian National pooling of passenger service between Montreal and Quebec, Montreal and Toronto and Toronto and Ottawa. The Toronto-Ottawa pool has been in effect for some months and that between the other points was put into operation on March 11. Under it the bulk of the Quebec-Montreal service is handled by the Canadian Pacific while the Canadian National is the chief reliance for service between Montreal and Toronto. Dr. Manion explained that the pool would save approximately 1,000,000 train-miles, or approximately \$1,000,000, annually, divided about equally between the two companies. Continuing, he said:

"The total number of engineers, firemen, conductors, and trainmen affected by the reduction of passenger train mileage is 96. This is also divided approximately equally between the two companies. A number of employees of other classes that incidentally will be affected cannot be definitely determined until services are actually in effect, but these will likewise be divided approximately equally between the two companies. In practically all cases employees displaced by pooling arrangements will retain employment by exercising seniority rights to other positions, resulting in junior employees being returned to freight service. With the improvement in traffic, Mr. Fullerton, chairman of the trustees of the Canadian National, states that the management is convinced that after the extension of pooling arranged for, is in effect, there will be more men in actual employment than at the time the Canadian National-Canadian Pacific Act, 1933, became effective, and that with continued improvement in traffic, there will not be any increased unemployment but rather the contrary. Arrangements as made for the pooling of passenger train services were adopted after careful consideration of all the conditions involved, so as to effect economies by avoiding duplication of train services and still maintain, with as little disturbance as possible, adequate service to the public.

In regard to the statement as to displacement of all Canadian National service between Montreal and Quebec, the Canadian National operates, and will continue to operate, between Montreal and

Levis, the Ocean Limited and Maritime Express, two trains in each direction daily, and has arranged to provide another train between Charny and the Palais station at Quebec connection with the Maritime Express to and from Montreal.

"Mr. Fullerton points out in this telegram that he has conferred with the Canadian Pacific, and that this statement which I have just read is a joint statement of the two companies.

"I am advised that 80 per cent of all passenger traffic between Montreal and Quebec has always been carried by the Canadian Pacific Railway, as it is an older line and passes through more of the settled communities on the north shore.

"In the pooling of passenger trains, the economies and the profits, if any, are split equally between the two railway companies. In this regard it may be well to point out that according to an official statement, which I hold in my hand, the increase in gross revenue, for the first two months of this year, for the Canadian National and Canadian Pacific Railways together, has been \$6,700,000, of which \$3,900,000 increase has gone to the Canadian National Railways and \$2,800,000 to the Canadian Pacific Railway. I mention this in reply to suggestions, which are sometimes made, that in agreements between the two companies the Canadian National Railways is getting an unfair deal.

"These figures of earnings show that apparently the management of the Canadian National Railways is looking after the interests of the Canadian National quite capably, and I have no doubt that the arrangements made between the Canadian National and Canadian Pacific Railway officials are made on a fair and equitable basis to both companies."

Ore Traffic Pool Proposed

The Chicago & North Western, the Wisconsin Central, the Minneapolis, St. Paul & Sault Ste. Marie, and the Gogebic & Montreal River have applied to the Interstate Commerce Commission for approval of a plan for pooling the ore traffic from the Gogebic range to the docks at Ashland, Wis., and to divide the earnings therefrom.

Amendment to Emergency Act Reported

The Senate committee on interstate commerce has submitted to the Senate a favorable report on S. 2411, which proposes to amend the emergency transportation act, 1933, to extend the labor provisions of the act to include the Pullman Company, express companies, and refrigerator-car companies controlled by railroads.

Further Delay Expected on Eastern Fare Cuts

Carriers seem disposed to continue studies—Southern roads report favorable results

A decision to postpone for another few months at least any general move among Eastern railroads to follow the lead of Western and Southern lines in installing reduced passenger fares is expected to be the outcome of next week's meeting of the Eastern passenger fare committee. It is understood that the larger Eastern roads, with one exception, are not disposed to base any fare-reduction action on results thus far observed in connection with the Western and Southern experiments; they prefer to continue the "watchful waiting" for another two or three months.

Other factors have been the tendency of passenger traffic to increase during the past few months without the stimulant of general rate concessions and the expectation that improved business will continue. In this latter connection there is the recent prediction of L. W. Landman, passenger traffic manager of the New York Central that a material increase in the volume of rail travel will come this Spring and next Summer.

"All indications are," said Mr. Landman, "that more people will be traveling this year than for some years past. Our passenger revenue for January and February exceeds that for the first two months of last year and forecasts the trend. Lower fares in many sections of the country; improved accommodations, such as the introduction on a large scale of air-conditioned cars; the gain in income of large sections of the population, including the farmers, and the depreciation of the dollar, together with the second edition of the World's Fair, which will be even more elaborate and spectacular than the original fair, all will tend to promote rail travel.

"The depreciation of the dollar has already had a favorable effect on our rail-water circle tours, whereby a traveler goes from New York via the West Indies and South America, through the Panama Canal to California by water returning by rail via the national parks, Grand Canyon and other domestic scenic attractions.

"Special rates to the World's Fair will be such that we expect to carry into Chicago even more than the 697,703 passengers the New York Central Lines transported last year during the period the Fair was opened."

Meanwhile reports from the Southern
(Continued on page 390)



Passenger Comfort is GOOD BUSINESS . . .



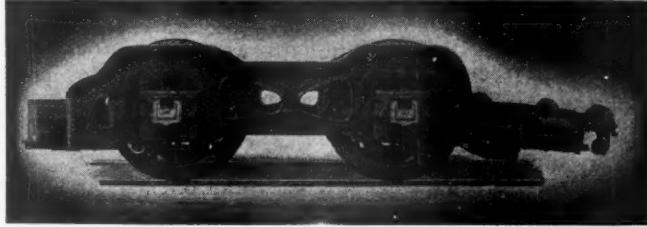
Give the passengers soft cushions, modern appointments and air-cooled

cars. It creates business. « But then don't spoil the effect by jerking them like a car of live-stock. Passengers can resent it. « Easy starts are important in building a reputation for comfortable travel. Many roads are using The Locomotive Booster to avoid jerks in starting and to keep up to schedules. « The Booster performs a valuable service wherever it is used. It adds the power of another pair of drivers, yet this power can be turned off or on as the demands rise or fall. Smooth starts, rapid acceleration to road speeds and on-time runs result. The passenger's good will is won—economical operation is obtained.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK CHICAGO

MONTREAL, CANADA



George H. Houston Heads Capital Goods Committee

President of the Baldwin Locomotive Works is selected by N.R.A. Administrator Johnson

At the general conference of code authorities and code committees representing the various industries with the National Recovery Administration at Washington last week, called for the purpose of revising the various codes with a view to creating more employment, George H. Houston, president of the Baldwin Locomotive Works, was designated by Administrator Johnson as chairman of a committee representing the capital goods industries to present the views of those industries as to the general problem. Another committee was appointed to represent the consumer goods industries and both held conferences with General Johnson on March 8, after which



George H. Houston

they remained in Washington for further conferences this week. In addresses before the general conference both President Roosevelt and General Johnson urged the representatives of industry to adopt a plan for shortening hours of labor and increasing wages and General Johnson suggested a plan for a general 10 per cent reduction in hours and increase in wage rates, possibly to be put into effect by an executive order which would allow particular companies or industries to apply for exceptions. It was recognized that a uniform plan could not be applied for all industries and the efforts of the N.R.A. seemed to be exerted toward voluntary proposals from the industries, possibly stimulated by the fact that a House committee had favorably reported a bill providing for a uniform 30-hour week for all industry.

Mr. Houston, who had urged the necessity for a distinct treatment of the capital goods industries at the general meeting, pointing out that a large proportion of the present unemployment is in that group, acted as chairman of a meeting at which a committee of fifteen was appointed and after the conference with Johnson issued a statement of its general attitude. It was stated that the committee has set machinery into motion to make a thorough study of problems of these industries with a view to reduction in unemployment and that appreciation had been expressed for the

recognition by the N.R.A. that special problems confront concerns in the durable goods field. In the statement Mr. Houston emphasized the importance of careful consideration of the unemployment problem in the durable goods industries because in this field of industry lies the key to restoration of normal employment, he said, adding that the committee approached its task with about 5,000,000 persons out of work in the durable goods industries in addition to approximately 4,000,000 unemployed service industry workers. An important objective of the committee will be to encourage the resumption of investment in durable goods.

"The solution of unemployment in the durable goods industries cannot be accomplished by a reduction of hours and increase of wages, inevitably followed by increased cost, with business volume so drastically reduced at this time," the statement said. "Purchase of durable goods diminishes rapidly with increasing price. Further curtailed demand for durable goods at this time would freeze unemployment now existing in this field for the indefinite future. Flexibility in hours of work as is possible under the codes is essential to the operation of the durable goods industry. This can only be accomplished in the face of conditions that will give security of principal and such rate of return as will encourage men to take the hazard of investment. The primary concern must be to restore those conditions that will cause the owners of capital to risk it in private enterprise and private enterprise again to undertake new ventures. To accomplish such a step, the amendment of the Securities Act of 1933 is necessary, as well as the rewriting of the proposed National Securities Exchange Act of 1934, so as to encourage the issuance and free exchange of industrial securities under reasonable and proper regulation without restriction of the capital needs of business."

Rivers and Harbors Appropriation

The House on March 8 passed the War Department appropriation bill including \$23,702,645 for rivers and harbors.

St. Lawrence Waterway Treaty Fails Of Ratification

The treaty with Canada providing for the construction of the St. Lawrence seaway failed of ratification in the Senate on March 14. The vote for ratification was 46 to 42 against, whereas a two-thirds vote was necessary for ratification. Thirty-four of the votes against the treaty represented States having ports of their own or bordering on the Mississippi Waterway.

It was indicated at the White House on Wednesday that the President took the position that it made comparatively little difference whether the treaty was adopted at this time or some other time because he insists that the St. Lawrence canal will eventually be built and that if this country does not participate Canada will proceed with the construction of a seaway on the Canadian side with which it could discriminate against United States shipping. It was indicated that the treaty would go back to the Senate later in some form.

Sees Public Ownership of Railroads by 1940

Present lack of understanding and indifference will bring it, says Virgil Jordan

"There is so little understanding of the situation and such great indifference toward it today that it is safe to say that by 1940, or not long after, our railroad system will be wholly in the hands of the government", declared Virgil Jordan, president of the National Industrial Conference Board, in an address on "Government Ownership of Railroads," delivered in New York on March 14 at a joint meeting of Traffic Club of New York and the New York Board of Trade. Dr. Jordan saw the consummation of the foregoing prediction as "certain unless there should be a great change in the attitude of the American people not only toward the railroad problem but toward all other economic problems, which is improbable."

"When the railroads are finally swallowed up in the maw of the governmental monster that is already feeding so greedily upon the productive effort of our people", Dr. Jordan's prediction continued, "our whole system of communications will inevitably go with it; and with the arteries and nerves of our economic life thus devoured the rest of the corpse of private enterprise will fall an easy and inevitable victim, and not a scrap will escape."

At another point the speaker decried the "spirit of bolshevism which is abroad today" which, beneath its fancy phrases and elaborate economic disguises, "is nothing but a mobilization of the greed and envy of the uncreative mob against the creative power and enterprise of the minority of individuals in the community whom the mob cannot imitate but only persecute and rob." This force must be reckoned with, Dr. Jordan warned, as he continued to say that "No one imagines that the man in the White House in his innermost soul desires to lead any such mobilization and if he is forced to do so by the fatal circumstances of destiny it will only be because there do not arise to his aid and support any other forces with sufficient intelligence, integrity and constructive will to lead in another direction."

When government ownership of railroads comes, Dr. Jordan said, "It will not be because of any inherent and inevitable weakness in the financial position of the American railroad system which is incurable under private ownership and operation, intelligently and fairly fostered and protected." In this connection he then commented on the "fashion peculiar to this period, among people who look at realities in the light of magic lantern pictures and blue-prints of the Perfect State, to talk in large terms about the "chaos" in our transportation system and the critical financial situation of the railroads."

Continuing, he pointed out how it is unfair to judge the position of the railroads on the basis of depression years, when, even in 1932, they earned about 80 per cent of their fixed charges and when they have borrowed from the government far

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Arch Brick supplied by the American Arch Company is surrounded by the essential services that make its use a success for the railroad.

First there's design. Practically every coal-burning locomotive built in recent years has had the cooperation of American Arch Company engineers in the design of its Arch. This design experience makes certain that Arch Brick are of proper size and shape and properly placed.

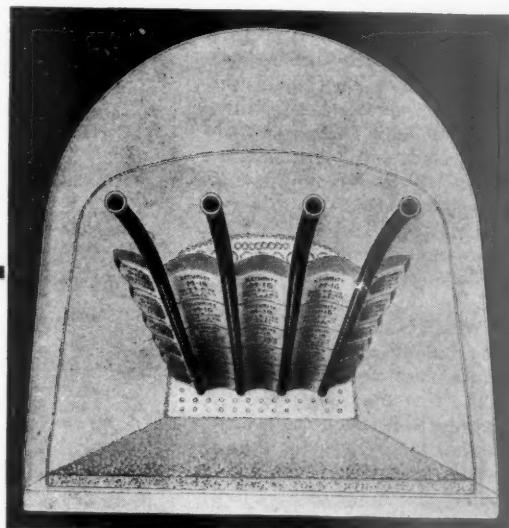
Next there is the service of supply, of long experience in working with the railroads, ready to respond instantly to a call for any needed size or shape of Arch Brick.

Finally there is the servicing that assists the railroads in combustion problems and in getting the utmost service from Arch Brick.

All these things are essential to a smooth-functioning Arch Brick supply. Their presence gives extra value to Arch Brick furnished by the American Arch Company.



**HARBISON-WALKER
REFRACTORIES CO.
*Refractory Specialists***



**AMERICAN ARCH CO.
INCORPORATED
*Locomotive Combustion
Specialists*** • • •

less than was the case during the World War.

Most significant of Co-ordinator Eastman's recent pronouncements on government ownership of railroads, Dr. Jordan thought, was the co-ordinator's reason as to why such public control will eventually come. "He (Mr. Eastman) says, in substance," Dr. Jordan said "that such comprehensive and detailed public regulations the railroads are now subjected to make private ownership impossible. In that passage the co-ordinator has put his finger unconsciously on the vital factor in the inescapable process of socialization that is taking place, not only in the railroads but in every other industry today, and thereby exposed the unconscious inconsistency and the subtle strategy in this fatal process."

Next Dr. Jordan discussed the adverse effect of excessive regulation on railway enterprise and initiative and continued to his consideration of the general tendency toward the mobilization of industry "The beneficence and omnipotence of government is the great delusion of the age," he said. "It has become the all-embracing racket of our time."

"We can maintain private enterprise in the railroads," he said in closing, "only by permitting private enterprise and investment to function to the fullest extent in their operation and development. This means that they must be able, in free competition with industry, other public utilities and government itself, to secure ample and dependable supplies of capital to refund maturing debts, strengthen their financial structure and maintain and improve their properties so as to render better and more economical service in competition with other forms of transportation.

"For this the fundamental requirement is restoration of the confidence of private investors in rail securities, and the revival of a natural capital market by removal of arbitrary and extreme governmental restrictions or threats of such restriction upon its operation. In some cases, relatively few, financial reorganization of railroad properties may be needed, together with temporary government assistance, but the latter will not have to be on any large scale. Much more important for the purpose in view would be a declaration by the Administration that it is the firm policy of the nation to foster private ownership and operation in the transportation field. This would be a more potent influence in restoring investor confidence than anything else, in view of the uncertainty that prevails on this point, and the same applies to other industries; but it must be accompanied by definite assurance through its own fiscal conduct that the government is not going to continue to preempt the capital market with its own demands for funds so as to force the railroads and all other industry to depend upon it for their capital requirements.

"Beyond this there are a few definite steps in legislative policy that are imperative for restoration of confidence of investors in rail securities. The burden of bureaucratic control and political pressure upon important elements of expense of the railroads and upon the time and energies of their executives must be lightened. By

relaxing the restrictions now placed upon them, the railroads must be set free to furnish full transportation service in every field to compete with all other forms upon a self-sustaining basis, without undue preference or advantage to any type of transportation or to any group of users of them. The government must be determined to restrain any group, and refrain itself, from imposing large added expenses for labor or for social purposes upon the railroads or any other transportation agency without regard to their capacity to secure the revenue necessary to meet them. It must recognize that adequate reserves for depreciation and obsolescence and reasonable amortization of bonded debt are required for financial soundness, and that rate levels must be adjusted to provide for such reserves.

"The necessity of these things, if private enterprise in the railroad field is to be preserved, and the benefits that will flow from them to all concerned, have become obvious enough. If they are forthcoming we can count confidently upon retaining our railroads as the backbone of our system of private business and seeing them grow in financial strength and in excellence and economy of service. But it is equally obvious that if they are not forthcoming we can have no such expectation; and in the light of the facts of the situation in which they stand today and of the public attitude

toward them, it is not pessimism but simple realism to say that they will probably not be done."

Railway Employment Increased in February

The number of railway employees in service at the middle of the month of February was 975,826, an increase of 10,176 as compared with the number in January, according to the Interstate Commerce Commission's monthly statement of railway employment. This was an increase of 3.64 per cent as compared with February, 1933. Maintenance of equipment and stores employees increased 7.48 per cent and train service employees increased 6.72 per cent.

Net Deficit For 1933 Was \$13,800,930

Class I railroads ended the year 1933 with a net deficit after fixed charges of \$13,800,930, as compared with a deficit of \$150,633,819 for 1932, according to the Interstate Commerce Commission's monthly compilation of selected income and balance sheet items. For the month of December there was a net income of \$14,700,975, as compared with \$3,674,305 for 1932. For the year the net railway operating income was \$474,309,196 and other income was \$194,159,684, while deductions amounted to \$682,269,930. The commission's compilation follows:

SELECTED INCOME AND BALANCE-SHEET ITEMS OF CLASS I STEAM RAILWAYS

Compiled from 145 reports (Form IBS) representing 150 steam railways

TOTALS FOR THE UNITED STATES (ALL REGIONS)†

For the month of December		Income Items	For the twelve months of	
1933	1932		1933	1932
\$37,762,941	\$32,304,900	1. Net railway operating income.....	\$474,309,196	\$326,317,907
36,918,877	34,028,788	2. Other income	194,159,684	211,939,647
74,681,818	66,333,688	3. Total income	668,468,880	538,257,554
11,661,414	11,167,409	4. Rent for leased roads	133,143,213	129,649,197
45,987,942	46,479,372	5. Interest deductions	532,618,503	531,776,490
2,331,487	5,012,602	6. Other deductions	16,508,094	27,465,686
59,980,843	62,659,383	7. Total deductions	682,269,930	688,891,373
14,700,975	3,674,305	8. Net income	d 13,800,930	d 150,633,819
		9. Dividend declarations (from income and surplus):		
9,531,922	3,510,778	9-01. On common stock	76,170,169	75,699,470
4,971,817	3,537,751	9-02. On preferred stock	16,550,487	18,226,853

BALANCE-SHEET ITEMS

Selected Asset Items

	Balance at end of December 1933
10. Investments in stocks, bonds, etc., other than those of affiliated companies (Total, Account 707).....	\$749,139,886
11. Cash	305,798,697
12. Demand loans and deposits	38,510,093
13. Time drafts and deposits	49,728,805
14. Special deposits	44,454,761
15. Loans and bills receivable	8,264,869
16. Traffic and car-service balances receivable	52,059,942
17. Net balance receivable from agents and conductors	38,715,569
18. Miscellaneous accounts receivable	140,517,870
19. Materials and supplies	291,310,361
20. Interest and dividends receivable	43,791,570
21. Rents receivable	1,859,523
22. Other current assets	4,807,597
23. Total current assets (Items 11 to 22).....	1,019,819,657
	1,026,978,506

Selected Liability Items

24. Funded debt maturing within six months*	296,930,365	241,476,327
25. Loans and bills payable	337,909,642	297,201,226
26. Traffic and car-service balances payable	66,050,074	66,281,511
27. Audited accounts and wages payable	198,670,307	202,701,459
28. Miscellaneous accounts payable	49,792,534	63,188,867
29. Interest matured unpaid	258,180,132	197,378,982
30. Dividends matured unpaid	14,247,018	13,303,402
31. Funded debt matured unpaid	97,092,060	50,102,394
32. Unmatured dividends declared	12,817,189	12,030,217
33. Unmatured interest accrued	94,366,397	95,029,047
34. Unmatured rents accrued	21,983,110	18,661,920
35. Other current liabilities	20,419,000	16,817,391
36. Total current liabilities (Items 25 to 35).....	1,171,527,463	1,032,696,416

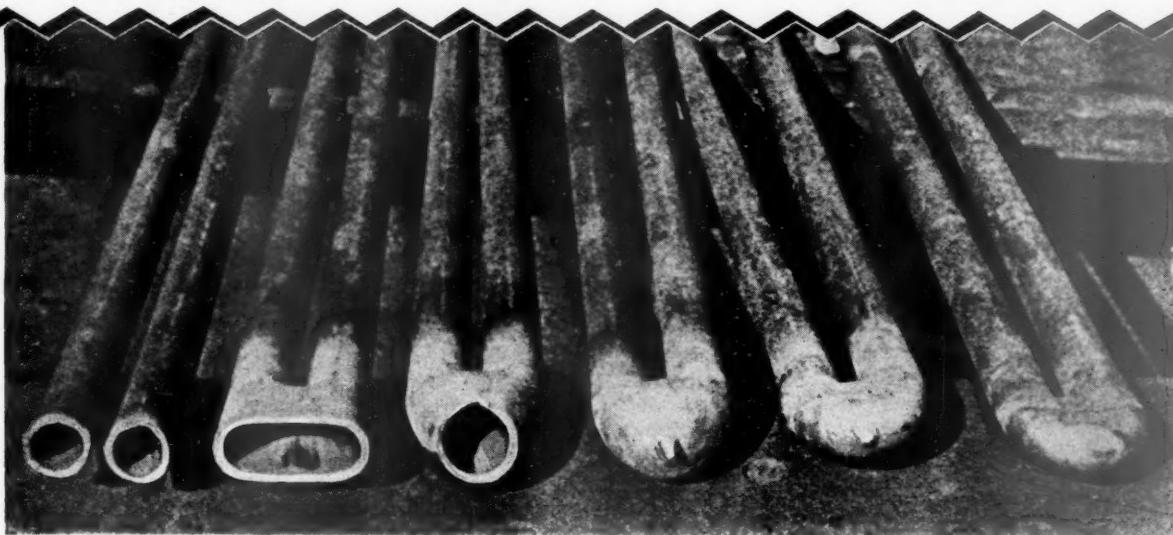
* Excludes returns for Class I Switching and Terminal Companies.

† Includes payments which will become due on account of principal of long-term debt (other than that in Account 764, Funded debt matured unpaid) within six months after close of month of report.

‡ Includes obligations which mature less than two years after date of issue.

§ Deficit.

Remanufacturing Superheater Units



Steps in the manufacturing process of the return bend — left to right: Two tubes to be forged together, breeches piece, preliminary swaging, final closing, flattening and finishing.



Superheater unit pipe ends being heated preparatory to upsetting ends for ball ends.



The above illustration shows one of the most important steps in remanufacturing superheater units . . . that of forging new return bends *integral* with the tubing.

Replacing damaged and worn return bends in this way with new return bends, forged from the tubing itself, is your guarantee that remanufactured units are restored to full effectiveness for many years of additional service. Furthermore it is an important factor in giving assurance against repairs at least until the next shopping.

Throughout the entire remanufacturing process the same precision methods are used as in making new units, thus providing units completely reconstructed to proper dimensions. The Elesco unit remanufacturing service is so thorough a job of reconditioning, that it is ultimately the cheapest means of handling failed and unserviceable superheater units.

THE SUPERHEATER COMPANY

Representative of AMERICAN THROTTLE COMPANY, Inc.

60 East 42nd Street
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Peoples Gas Building
CHICAGO

Canada: The Superheater Company, Limited, Montreal

Superheaters - Feed Water Heaters - Exhaust Steam Injectors - Superheated Steam Pyrometers - American Throttles

Further Delay Expected on Eastern Fare Cuts

(Continued from page 387)

and Norfolk & Western indicate that low fares recently placed in effect are bringing substantial increases in traffic to those roads. On the Southern the reduced rates became effective December 1, 1933, while the Norfolk & Western made general reductions on February 1.

The coach rate on the Southern has been reduced to 1½ cents per mile and one-way tickets for travel in Pullman cars are sold at the rate of 3 cents per mile with the surcharge eliminated. Additional concessions on this road are the two-cent-a-mile round-trip 15-day tickets and the 2½-cent-a-mile 30-day round-trip fares, both valid for Pullman travel. Since these reductions became effective, Southern passenger traffic officers report, business "has shown a substantial and consistent increase, both in number of passengers handled and in revenues." The Southern also anticipates a further improvement in business with the approach of Spring.

Passenger business on the Norfolk & Western, which has steadily decreased during the past ten years, is coming back, according to figures recently made public by John L. Bladon, passenger traffic manager of that road. In 1933, for the first time in a decade, there was an increase in the number of passengers carried, this increase amounting to 74,922 passengers or 9.66 per cent. Further gains were reported for January and February of this year, the increase for the former over the corresponding month of last year being 33 per cent, while February traffic jumped 79.57 per cent, as compared with February, 1932. This latter, the first month the low fares were in effect, reflects the influence of the general rate reduction; Mr. Bladon regards this fare reduction as the primary cause for the great increase in business during February. After experimenting with a two-cent rate on several sections of its line for more than a year, the Norfolk & Western on February 1 cut passenger fares to two cents a mile in coaches and three cents a mile in Pullman cars with the elimination of the surcharge on all trains on the system.

"The reduction in passenger rates, which amounted to approximately 44 per cent from the base tariffs," Mr. Bladon said, "is the primary cause for the increase in our passenger business. On November 15, 1932, the Norfolk & Western reduced fares on its Winston-Salem line to two cents a mile. The results were encouraging, and several months later, the railway authorized the two-cent rate on our Bristol line. On December 1 a two-cent coach rate, and a three-cent rate in Pullman cars with the elimination of the surcharge, was put into effect on the greater part of the system. On February 1 of this year these rates were made applicable to the entire system.

"Improved economic conditions and the inclement weather of the last month have also been important factors in boosting rail travel this year. We got a lot of business in February during the snow and storms when the highways were blocked and congested. For you know passenger trains

run in all kinds of weather." Mr. Bladon also predicted the passenger traffic of the railroad in March would show a substantial increase over the same month of last year.

As to passenger income, Mr. Bladon declared that revenues from this phase of the railroad's business were nowhere near as large as the gain in the number of passengers. He explained that "it takes 80 per cent more passengers under the two-cent rate to equal revenues under the old rates. February was the first month which gave a complete picture of the situation. The estimated increase in passenger revenues, not including mail and express, amounted to 15.59 per cent."

Costly Snow in Connecticut

The New York, New Haven & Hartford, in announcing that for the month of February expenses will exceed receipts, says that the severe snow storms of the month cost the company \$600,000. The total fall was 46.3 inches, the highest since the records have been kept. On 18 days, the temperature was continuously below freezing. Half of the sum named was for snow removal, which at times employed 5000 men. Other expenses greatly increased were: consumption of fuel, and overtime for men in various services, reducing the size of trains and feeding passengers delayed on snow-bound trains.

In the present month, freight traffic is running 33 per cent better than a year ago.

Associated Traffic Clubs Meeting

The semi-annual meeting of the Associated Traffic Clubs of America will be held at the Tutwiler Hotel, Birmingham, Ala., on April 24-25. The general topic of the convention will be transportation legislation as it affects the motor trucks, the railroads, the inland waterways and the intercoastal steamship lines. Emory R. Johnson, professor of transportation and commerce of the University of Pennsylvania; Judge R. V. Fletcher, general counsel of the American Railway Association; and J. L. Keeshin, president of the Keeshin Motor Express and president of the National Highway Freight Association, will speak on government ownership of railways, railroads and motor trucks, respectively.

Long Island Provisions Against Snow Blockades

The Long Island has made public its special provisions for clearing its tracks of snow, with a view to more adequate preparation against blockades, and lists the different items under 10 heads. This announcement was made at a public hearing, held by the New York State Transit Commission, in connection with complaints which had been made following the serious blockades on the New York suburban lines last month.

The program is, in substance, as follows:

1. Addition of five chloride cars.
2. Addition of eight flanger cars.
3. An emergency information bureau at the headquarters in Jamaica, with telephone communication with the principal stations and terminals. It is proposed to issue bulletins at least every 30 minutes when there is an extensive suspension of trains.
4. Loud-speaker instruments for announcements in the terminals in Manhattan and Brooklyn.
5. Empty trains will be run when necessary, while snow is falling, to keep tracks clear.

6. Six additional steam locomotives will be equipped with blowers for clearing switches (eight locomotives already are thus equipped).

7. All steam locomotives will have flanger boards on the pilots.

8. Oil-burning heaters will be installed on some of the switches, where now dependence is placed wholly on electric heaters.

9. Crossing watchmen will be provided with salt to keep flangeways clear.

10. Spare steam locomotives will be kept ready for immediate service, between November 1 and April 1.

Following the recent interruption of traffic by deep snow, the road announced that each holder of a monthly season ticket would be repaid the value of the coupons for two round-trips; and an officer of the company says that about \$14,000 has already been thus refunded.

Construction

CHICAGO & NORTH WESTERN.—A contract has been awarded to the Wickes Engineering & Construction Co., Des Moines, Iowa, for the construction of the substructure of a subway to carry this company's tracks over U. S. Highway 60 near Webster City, Iowa. The structure will consist of a 50-ft. through plate-girder span carried on concrete abutments.

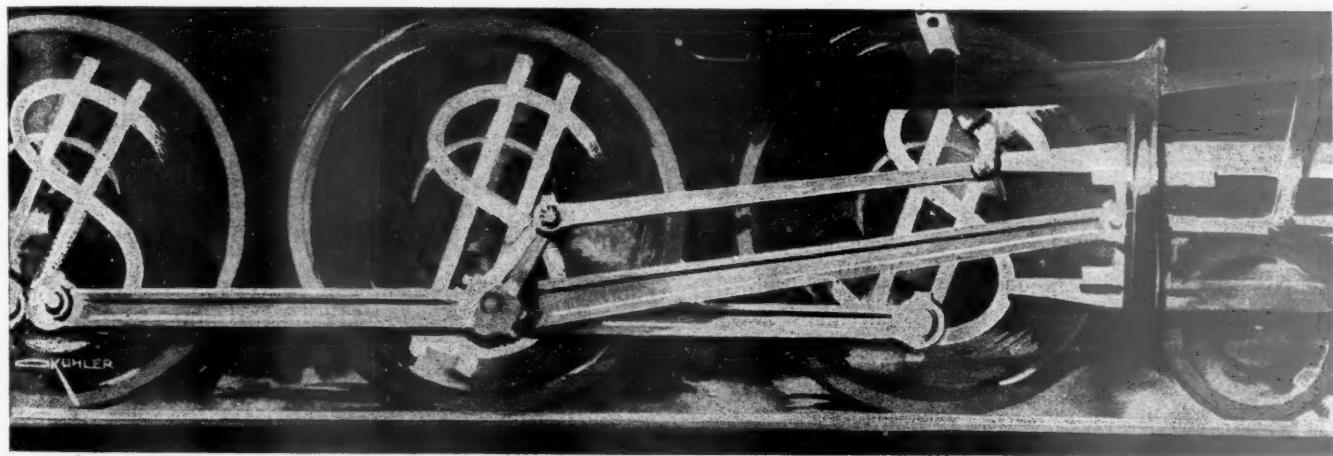
DELaware, LACKAWANNA & WESTERN—ERIE.—The New York Public Service Commission has approved as not excessive three low bids for certain work in connection with the elimination of the grade crossings of the Delaware, Lackawanna & Western and the Erie in the town of Big Flats and the town and village of Horseheads in Chemung county, N. Y. The bids approved are as follows: One of \$19,371 submitted to the D. L. & W. by F. W. Smith & Company, Cleveland, Ohio, for the construction of a railroad bridge and embankments, and another of \$5,164 submitted to the same road by the American Bridge Company for the furnishing and delivering of structural steel; a bid of \$17,425 submitted to the Erie by L. C. Whitford, Wellsville, N. Y., for the construction of an overhead bridge.

LEHIGH VALLEY.—A petition of this road for a rehearing on an order for the elimination of the Cedar Swamp crossing in the town of Henrietta, Monroe county, N. Y., has been denied by the New York Public Service Commission. The order directed the elimination of this crossing by placing the highway above the railroad at an estimated cost of \$124,000.

LONG ISLAND.—A contract has been given to the Wilson & English Construction Company for work on bridge 2A at Forest Park, N. Y., involving the use of 290 tons of steel.

PENNSYLVANIA.—The New Jersey Board of Public Utility Commissioners has ruled that construction work shall be started May 1 on the elimination of the grade crossing over the Pennsylvania tracks at Oak Tree road, Iselin, N. J., and on November 1 construction is to be started on the elimination of the grade crossing at Colonia Boulevard, Colonia, N. J. Both crossings are to be completed by April 30, 1935.

DOLLARS AND DRIVERS



AMERICAN LOCOMOTIVE COMPANY

"It is the rule rather than the exception for delivery between shippers and consignees 200 or 300 miles apart to be demanded in time for the opening of business on the following day. The carrier which can perform this service generally gets the traffic. The motor truck can and does perform this task readily. . . . 73% of all tonnage which moves by truck, according to the statements of shippers, does so partly because that service is faster than railway service. . . . It is this speed which railways must match or exceed if their efforts toward freight traffic recovery and traffic development are to attain their goal."

(Railway Age — December 23, 1933)

Freight traffic at its peak amounted to nearly 5 billions of dollars. Last year it approximated 2½

billions. At all times it is by far the main and most important source of railroad revenue. And it seems that speed is becoming a very influential factor in this traffic also.

So why not take inventory — count up the number of freight locomotives you have that have 69 inch drivers or over? It will give you a line on your position from a competitive standpoint in your most essential field. For no matter how you look at it — whether it is a question of handling your traffic in the most economical way — of retaining the traffic that you already have — or of regaining some of the traffic you have lost — one big fact should be kept in mind.

Within certain limits, dollars and drivers grow together — the larger the one, the larger the other.

30 CHURCH STREET NEW YORK N.Y.

Equipment and Supplies

P.W.A. Loans to Railroads

The Public Works Administration has signed a contract with the Boston & Maine, covering a loan of \$2,230,000 for rails and fastenings and a contract for a loan \$2,628,000 for new equipment is in the course of preparation. This road has applied to the Interstate Commerce Commission for approval of the expenditure of \$1,550,000, the proceeds of a loan from the P. W. A., for repairs to roadway and track and signal work. The application also refers to another proposed loan for the acquisition of 1 Diesel-electric switching locomotive, 3 Diesel-electric passenger units, 5 mountain type and 5 Pacific type locomotives, 10 de luxe passenger coaches, and 21 suburban coaches.

The receivers of the Seaboard Air Line have applied to the Public Works Administration for a loan of \$3,000,000 to \$3,500,000 and have applied to the Interstate Commerce Commission for authority for the expenditure for the purchase of 5 locomotives, 1,000 fifty-ton box cars, and 100 phosphate cars.

A contract signed on March 9 by the Public Works Administrator for a loan of \$331,000 to the Pittsburgh & West Virginia will create 153,000 man-hours of work in the next seven months for employees of the Baldwin locomotive plant building three new locomotives.

The Erie has been authorized to use \$623,000 of a previously made allotment of \$11,964,000 for converting 750 drop-bottom gondola cars into self-clearing hopper cars. The work is to be done in the Erie's own shops.

The allotment of \$11,964,000 originally made to the Erie was to be used entirely for the purchase of 3,775 new freight cars and 133 new passenger train cars. It was made on the basis of estimates of cost. Since the allotment was made competitive bids have been obtained and contracts awarded for building all of the new equipment at a total cost of \$11,282,000, or \$682,000 less than the allotment, enabling the Erie to use \$623,000 of that amount to give its shopmen work on the job of converting the 750 cars.

The Baltimore & Ohio has applied to the Interstate Commerce Commission for approval of the expenditure of \$4,000,000, to be obtained by a loan allotted by the P.W.A., for the construction of 820 fifty-ton steel gondola cars, at an estimated cost of \$1,145,244, heavy repairs to 4,800 freight cars, \$1,923,000, reconstruction of 200 automobile box cars, \$134,000, and reconditioning 240 locomotives, \$1,078,000. The total cost of the work is estimated at \$4,279,244, of which \$1,188,637 is for labor and \$3,090,607 is for materials.

The Midland Continental, which was allotted a loan of \$40,000 to be used in the purchase of a Diesel-electric locomotive, has applied to the Interstate Commerce Commission for an amended authorization of the proposed expenditure to permit it to purchase such a locomotive from the

Westinghouse Electric & Manufacturing Company at a cost of \$52,000, in place of one on which it had received bids.

Execution of the contract under which the Public Works Administration will loan the Kansas, Oklahoma & Gulf \$255,000 for the purchase of 5,186 tons of rail and the necessary fastenings and switches was announced on March 13. Besides the employment to be created by manufacture of the rails this loan will create additional employment in the manufacture of 178,500 tie plates, 8,475 pairs of rail joints, 600 kegs of spikes, 380 kegs of track bolts, 50 guard rails, 5 solid frogs and 20 spring frogs, 25 switches, 50 pairs of compromise bars and 4 taper rails.

Contracts covering \$150,447,000 of the \$199,607,800 funds allotted by the Public Works Administration for loans to railroads have now been signed by Administrator Ickes.

The Maine Central has applied to the Interstate Commerce Commission for authority for the expenditure of \$313,000 for which it has applied to the P. W. A. for a loan for the purchase and installation of 4,200 tons of 112-pound rails, together with fastenings.

LOCOMOTIVES

THE PITTSBURGH & WEST VIRGINIA has ordered three 2-6-6-4 Mallet type locomotives from the Baldwin Locomotive Works. Funds to pay for this equipment were obtained from a P. W. A. loan. See *Railway Age* of February 17, page 273.

FREIGHT CARS

THE ERIE is inquiring for 50 bulk cement cars of 50 tons' capacity.

THE DONNER-HANNA COKE CORPORATION has awarded a contract to the Pressed Steel Car Company for the rebuilding of 100 hopper cars of 70 tons capacity.

PASSENGER CARS

THE NEW YORK, NEW HAVEN & HARTFORD, reported in the *Railway Age* of January 20 as inquiring for 50 passenger cars, has ordered this equipment from the Pullman-Bradley Car Corporation.

THE NEW YORK, NEW HAVEN & HARTFORD has ordered from the Safety Car Heating & Lighting Company 69 complete compressor-type air-conditioning equipments, using Freon as the refrigerant. Fifty-seven of the equipments will have a capacity of seven tons, and will be used on deluxe coaches. The other 12 equipments will have a capacity of five tons and will be used on combination deluxe coaches and baggage cars. All of the cars will derive the necessary power for air-conditioning and lighting from 15-kw. safety generator equipments, using Dayton-Roderwald, cog-belt and gear, axle-drives.

IRON AND STEEL

THE ST. LOUIS-SAN FRANCISCO has ordered 18,000 tons of rails and 2,000 tons

of fastenings from the Tennessee Coal, Iron & Railroad Company.

THE READING has ordered from the McClintic-Marshall Corporation 180 tons of steel to be used in the construction of a bridge at Gordon, Pa.

LONG ISLAND.—An order for 180 tons of steel to be used in bridge work at Glendale, Long Island, N. Y., has been given to the McClintic-Marshall Corporation. The George A. Fuller Company is the contractor.

LONG ISLAND.—A contract for 290 tons of steel has been given to the McClintic-Marshall Corporation for work on bridge 2A of the Long Island at Forest Park, Long Island, N. Y. The Wilson & English Construction Company has the general contract.

LONG ISLAND.—An order has been given to the McClintic-Marshall Corporation for 350 tons of steel to be used in grade crossing separation work on the Long Island at Amityville, Long Island, N. Y. The Faircroft Engineering Corporation, Brooklyn, N. Y., has the general contract for the work.

MISCELLANEOUS

THE WESTERN MARYLAND has ordered 10 loco valve pilots from the Valve Pilot Corporation, New York. THE ERIE recently placed an order with the same company for two valve pilots.

THE NORTHERN PACIFIC has placed an order with the Timken Roller Bearing Company, Canton, Ohio, for Timken bearings to be used on all axles, including driving axles, on 10 large class 4-8-4 high speed passenger locomotives recently ordered from the Baldwin Locomotive Works.

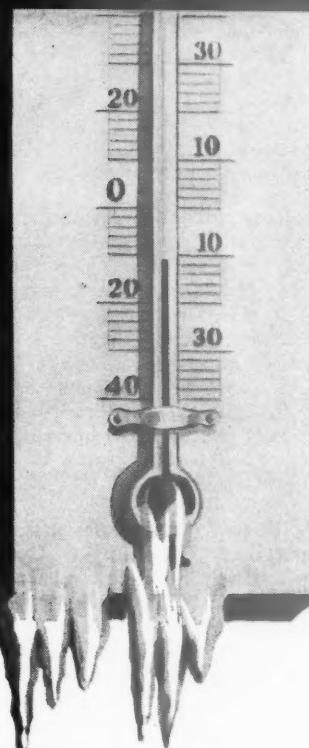
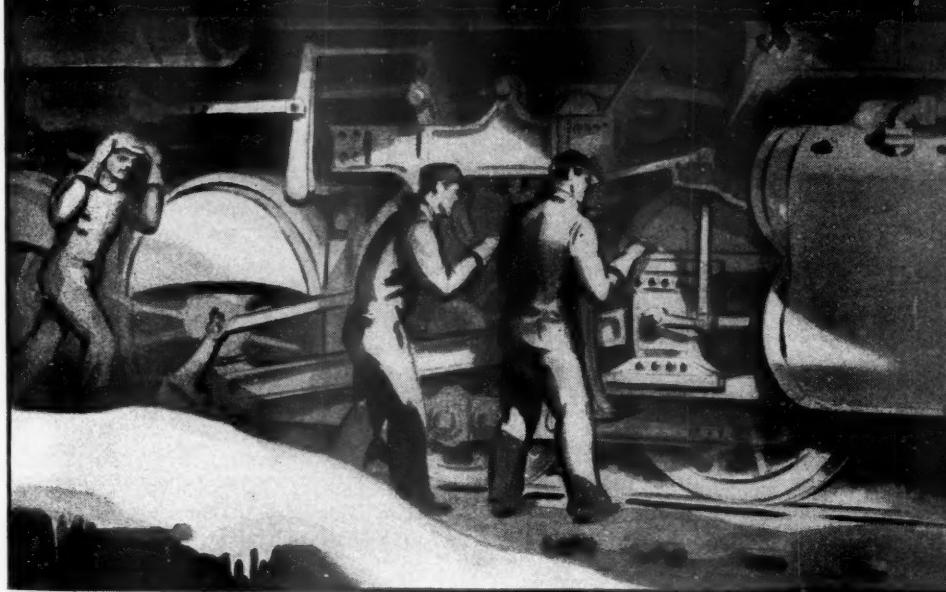
THE MISSOURI-KANSAS-TEXAS has just completed four new diners completely equipped with kitchen and pantry equipment of Enduro stainless steel, a product of the Republic Steel Corporation, Central Alloy division, Massillon, Ohio. The equipment was fabricated and installed by the M-K-T forces at the passenger car shops, Sedalia, Mo. Present plans call for four more diners of this type. In addition to these diners, three de luxe club cars with soda fountains and back bars of Enduro stainless steel are in service on M-K-T lines.

THE ATCHISON, TOPEKA & SANTA FE has granted M. E. Gregory, an inventor, permission to use one of its rail motor cars and a section of its track between Boise City, Okla., and Farley, N. M., in an attempt to operate the car by electrical energy transmitted by radio. To make possible the experiment, which will take place within the next few weeks, two 60-ft. towers have been constructed on railroad property at Boise City. Current will be generated at Boise City and transmitted through the air. As the coach moves along, it will pick up the power on a small aerial and pass it to rectifying tubes, which will feed it to the motor on the car.

COLD



HAS STOPPED CAUSING FAILURES



Railroads operating in cold climates found that breakage of

parts increased sharply in cold weather. « « « "Can you help us", they

asked Republic metallurgists. After extensive research a special Agathon Nickel Alloy Iron was developed

that was unaffected by cold brittleness. « « « So, too, on firebox sheets, staybolts and other equipment problems,

Republic has developed special alloy steels and irons that result in greater reliability

in service and lower repair costs. « « « Consult Republic on your materials problems.

CENTRAL ALLOY DIVISION, MASSILLON, OHIO

Toncon Iron Boiler Tubes, Pipe, Plates, Culveris, Rivets, Tender Plates and Firebox Sheets • Sheets and Strip for special railroad purposes • Agathon Alloy Steels for Locomotive Parts • Agathon Engine Bolt Steel • Agathon Iron for pins and bushings • Agathon Staybolt Iron • Climax Steel Staybolts • Upson Bolts and Nuts • Track Material, Money Guard Rail Assemblies • Enduro Stainless Steel for dining car equipment, for refrigeration cars and for firebox sheets • Agathon Nickel Forging Steel.



REPUBLIC STEEL
CORPORATION
GENERAL OFFICES — YOUNGSTOWN, OHIO



Supply Trade

Ralph G. Caulley has joined the Detroit, Mich., district sales office of **Republic Steel Corporation**, Youngstown, Ohio. Mr. Caulley had been connected with the Wheeling Steel Corporation for 14 years, the last 7 of which were spent in the Detroit district.

The National Recovery Administration has announced the appointment of **E. G. Vail**, formerly president of the Gurney Refrigerator Company, Fond du Lac, Wis., as the administration member of the code authority for the railway brass car and locomotive journal bearings and castings manufacturing industry.

The Russell, Burdsall & Ward Bolt & Nut Company, Port Chester, N. Y., has acquired from the **American Marsden Company**, Jersey City, N. J., the sole manufacturing and sales rights in the United States of the Marsden locknut. A Marsden locknut division has been created at Port Chester. **C. E. S. Place**, formerly chief engineer of the Marsden Company, now is associated with Russell, Burdsall & Ward in this connection.

The Ross and White Company, Chicago, has concluded a contract agreement with the Universal Gear Corporation, Indianapolis, Ind., for the exclusive railway sale of its speed reduction unit for locomotive coaling plants. This company has also entered into an arrangement with the Standard Conveyor Company, St. Paul, Minn., for the exclusive railroad rights to its patents on spiral coal lowering chutes for locomotive coaling plants to prevent breakage of coal.

C. L. Sheen, district sales manager of the **American Locomotive Company** and the **Railway Steel-Spring Company** at San Francisco, Cal., has been promoted to a position in the St. Louis, Mo., office. Mr. Sheen has been connected with the American Locomotive Company in various positions for the past 14 years and for the past 7 years has been located on the Pacific coast. **Marshall D. Raymond** has been appointed district sales manager of the American Locomotive Company and the Railway Steel-Spring Company in San Francisco. Mr. Raymond was previously connected with the New York and St. Louis offices.

Westinghouse Electric & Manufacturing Company Annual Report

The Westinghouse Electric & Manufacturing Company for the year ending December 31, 1933, reported a net loss of \$8,636,841 or \$266,699 less than the 1932 net loss of \$8,903,540. In the years 1931 and 1930, respectively, Westinghouse reported a net loss of \$3,655,659 and a net income of \$11,881,705.

Sales billed last year totaled \$68,188,353 as compared with \$77,073,586 in 1932, a decrease of 11.5 per cent. Orders received during 1933, on the other hand, increased 5 per cent over those of the previous year, the total being \$72,473,117 as compared with

\$69,082,468. In this connection the report notes that "there was a decided contrast between the two years", since in 1932 the trend was downward throughout the year whereas in 1933 the trend turned upward starting from the low point in January. The volume of business received in the second half of last year was 48 per cent greater than the volume for the corresponding period of 1932. Among the devices developed during last year, Diesel engines for transportation work are listed.

The balance sheet as of December 31 lists total current assets of \$75,379,756 and total current liabilities of \$4,554,537. The net working capital is thus \$70,825,219 and the ratio of current assets to current liabilities of 16.6 to 1. The surplus account at the close of the year showed a credit balance of \$40,564,474 as compared with \$62,046,797 on December 31, 1932. Deductions, in addition to that resulting from the year's loss, were the \$11,043,216 adjustment in connection with the distribution, as a dividend on Westinghouse common and preferred stock, of the company's holdings of Radio Corporation of America stocks; the \$1,036,555 provision for declines in the market value of securities and investments; and miscellaneous adjustments of \$765,708.

The consolidated income and surplus account for the year 1933 is as follows:

NET SALES	\$68,188,353
COST OF SALES:	
Manufacturing cost and all distribution, administration and general expenses—including provision for taxes, service annuities, operating reserves, and depreciation of buildings and equipment	78,290,698
LOSS FROM SALES.....	\$10,102,345
OTHER CHARGES:	
Current operating loss of subsidiary companies not included in consolidation	878,580
LOSS FROM OPERATIONS.....	\$10,980,925
LESS INCOME CREDITS:	
Interest, discount and miscellaneous income, net.....	+\$991,151
Dividends and interest on investments	1,273,664
TOTAL	\$2,264,815
NET LOSS before foreign exchange adjustments	\$8,716,111
ADJUSTMENTS on account of exchange fluctuations, net (1933, gain; 1932, loss).....	79,270
NET LOSS FOR THE YEAR.....	\$8,636,841
SURPLUS at beginning of year.....	62,046,797
SURPLUS before adjustments and dividends	\$53,409,956
ADJUSTMENTS:	
Provision for decline in value of securities	\$1,036,556
Adjustment on RCA stock distributed as a dividend.....	3,201,760
Miscellaneous, net	765,709
TOTAL	\$5,004,025
SURPLUS before dividends.....	\$48,405,931
DIVIDENDS:	
On preferred capital stock.....	\$247,376
On common capital stock.....	7,594,081
TOTAL	+\$7,841,457
SURPLUS at end of year including \$16,293,860.00 paid-in surplus representing premium on sale of additional common capital stock in 1929	\$40,564,474

Note—Provision for plant and equipment depreciation for companies included in the foregoing statement, for the year 1933 amounted to \$5,081,299.74 and for the year 1932 amounted to \$5,274,857.52.

* Includes a profit of \$493,123.90 in 1933 and

\$778,887.87 in 1932 from the sale of Radio Corporation of America stock.

† Difference between value as carried on books of this company of Radio Corporation of America stock distributed as a dividend and market value at date of declaration of such dividend or \$3.50 optional cash dividend per share on preferred stock.

* The 1933 dividend represents market value at date of declaration of Radio Corporation of America common stock distributed as a dividend or \$3.50 optional cash dividend per share on preferred stock.

OBITUARY

Jacob Seibert, owner and editor of the Commercial and Financial Chronicle, New York, died in Brooklyn, N. Y., on March 14 at the age of 77.

August Schlafly, chairman of the board of the Potosi Tie & Lumber Co., died at his winter home at Miami, Fla., on March 5, at the age of 84 years.

Financial

ATLANTIC COAST LINE.—Notes.—This company has applied to the Interstate Commerce Commission for authority to pledge and repledge \$15,000,000 of general unified mortgage 4½ per cent bonds as collateral for short term notes.

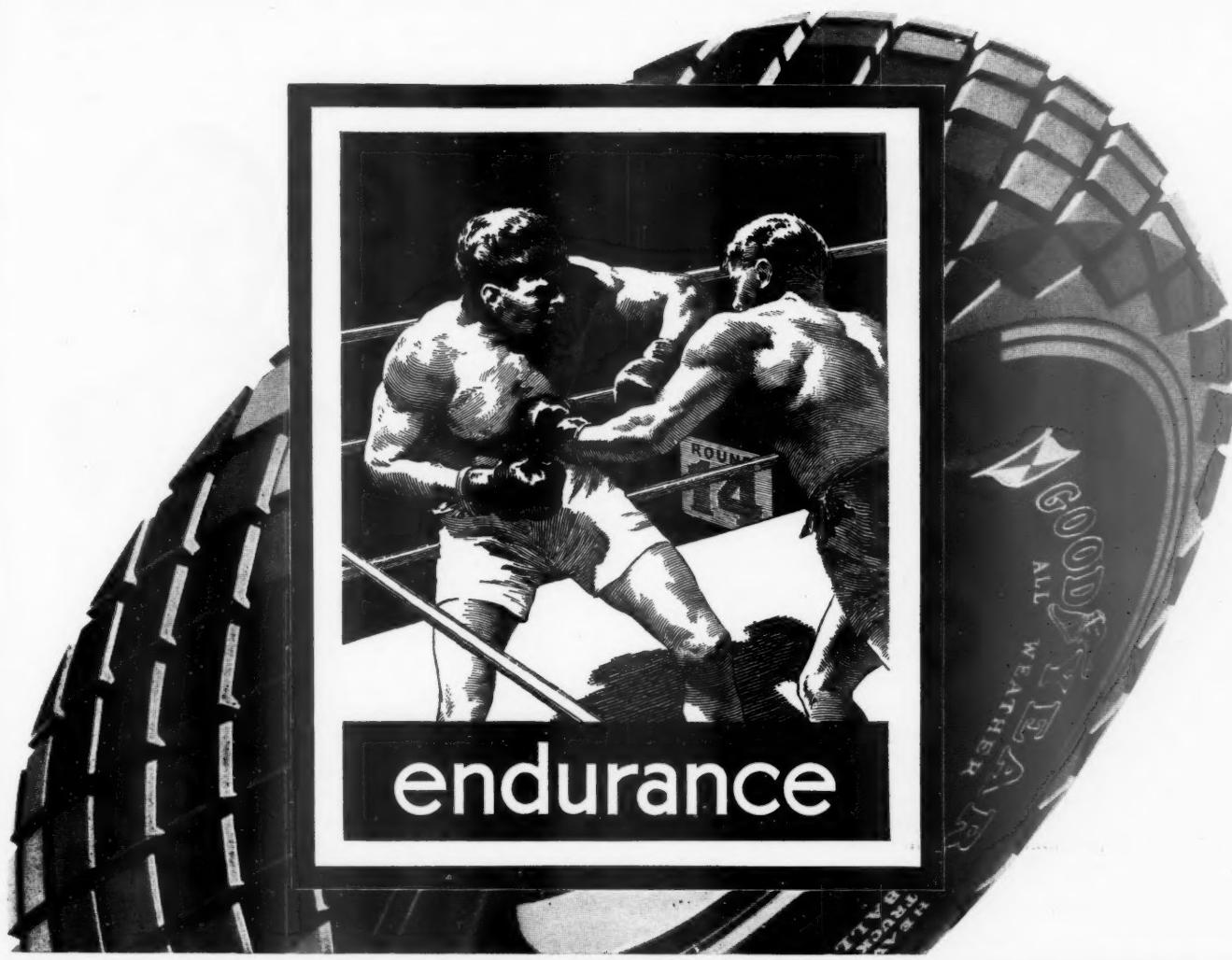
BALTIMORE & OHIO.—P. W. A. Loan.—The Interstate Commerce Commission has approved the proposed expenditure of \$1,500,000, the proceeds of a loan from the Public Works Administration, for the purchase of 35,000 tons of rails and fastenings.

BALTIMORE & OHIO.—P. W. A. Loan.—This company has applied to the Interstate Commerce Commission for authority to assume obligation and liability in respect of \$4,000,000 of ten-year registered 4 per cent serial notes in connection with a loan from the Public Works Administration for the construction and repair of equipment. The company expects to pledge as collateral security its equity in collateral now pledged to the Reconstruction Finance Corporation, having a par value of \$181,308,850, as collateral for loans amounting to \$69,573,377, stating that due to the appreciation of the securities the collateral now has a market or appraised value of \$125,658,221, or 177 per cent of the loans.

BOSTON & MAINE.—P. W. A. Loan.—The Interstate Commerce Commission has authorized an issue of \$910,000 of 4 per cent serial collateral notes in connection with the loan from the Public Works Administration to finance proposed maintenance work. The agreement with the P. W. A. provides for the assignment as collateral of the company's equity in bonds now pledged as collateral for a loan from the Reconstruction Finance Corporation.

CANADIAN PACIFIC.—Preliminary Report for 1933.—The preliminary report on earnings of this company for 1933, shows net from railway operations of \$20,862,106, as compared with \$20,089,985 in 1932. Gross for the year amounted to \$114,269,688, as against \$123,936,714 in the preceding

Continued on next left-hand page



They Can "Take It"

It's ENDURANCE that counts . . . And Goodyear Truck Tires can "take it"—mile after mile, month after month. They outperform all others.

Underneath that thick, slow-wearing, road-gripping All-Weather tread is a body of patented pre-shrunk Supertwist Cord—found only in Goodyear Truck Tires.

Supertwist has up to 61% more stretch than other cords. It keeps its life and elasticity long after other cords sag and fail.

That extra elasticity, that extra vitality adds thousands of miles to tire life—holds tire expense to the very minimum.

Goodyear also builds a complete line of Industrial Truck Tires for both power driven and hand operated trucks. A valuable new development is the Goodyear pneumatic tire for wheelbarrows, hand trucks and all types of carrying equipment.

Write Goodyear, Akron, Ohio, or Los Angeles, Calif. for further information.



GOODRIDGE *YEAR*
TRUCK AND BUS TIRES — *Money savers*

year, but this decline was more than offset by a reduction in operating expenses, which in 1933 amounted to \$93,407,582, compared with \$103,846,729 in 1932. Special income (from other than railway operations) totaled \$6,222,481, as against \$4,537,425 in 1932. Total income for 1933 amounted to \$27,084,587. Deduction of fixed charges at \$24,388,615, left a net of \$2,695,972. Reduction of pension fund requirements of \$1,438,811, brought net income for the year to \$1,257,161.

CAROLINA & NORTHEASTERN.—*Abandonment.*—Division 4 of the Interstate Commerce Commission has authorized this company to abandon its entire line in Northampton county, N. C.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—*Bond Extension.*—This company is requesting holders of \$2,117,000 Milwaukee & Northern consolidated mortgage 4½ per cent bonds to extend their maturity date five years from June 1. In consideration thereof the company agrees, subject to the approval of the Interstate Commerce Commission, to assume payment of interest and principal, which it has not done so far, and to pay upon presentation interest not due until June 1 plus \$50 a bond to assenting holders.

ERIE.—*P. W. A. Loan.*—This company, which had filed two applications to the Interstate Commerce Commission for authority to issue 4 per cent serial registered notes in connection with its loans from the Public Works Administration, has filed a supplemental application for a single set of notes to the amount of \$2,671,000, stating that the P. W. A. preferred to have one loan instead of two.

ILLINOIS CENTRAL.—*Abandonment.*—The Interstate Commerce Commission, Division 4, has authorized this company to abandon operation under trackage rights over a line of the Missouri Pacific in Douglas county, Neb., and to operate over the Union Pacific from Carter Lake, Neb., to South Omaha, 7.36 miles.

KANSAS, OKLAHOMA & GULF.—*P. W. A. Loan.*—Division 4 of the Interstate Commerce Commission has authorized this company to issue \$255,000 of 4 per cent registered serial notes in connection with a loan from the P. W. A.

LEHIGH & NEW ENGLAND.—*P. W. A. Loan.*—This company has applied to the Interstate Commerce Commission for authority for an issue of \$1,212,000 of equipment trust certificates in connection with a loan from the P. W. A.

LEHIGH VALLEY.—*P. W. A. Loan.*—The Interstate Commerce Commission has approved the proposed expenditure of \$600,000, proceeds of a loan from the P. W. A., for the purchase of 5 locomotives.

PACIFIC COAST.—*R. F. C. Loan.*—The Interstate Commerce Commission, Division 4, has conditionally approved a loan of \$70,000 from the Reconstruction Finance Corporation for the purpose of repairing flood damage. Commissioner Mahaffie dissented, saying the company needs reorganizing and that its resources have been drained by a holding company.

PENNSYLVANIA.—*Bonds.*—The Connecting Railway has applied to the Interstate

Commerce Commission for authority to reduce the interest rate on \$934,000 of first mortgage bonds guaranteed by the Pennsylvania from 5 to 4 per cent, and the Delaware Railroad has filed a similar application as to \$750,000 of bonds.

PITTSBURGH & WEST VIRGINIA.—*P. W. A. Loan.*—The Interstate Commerce Commission, Division 4, has authorized an issue of \$331,000 of equipment trust certificates in connection with a loan from the P. W. A.

SEABOARD AIR LINE.—*P. W. A. Loan.*—The receivers have applied to the Interstate Commerce Commission for authority to issue \$3,000,000 to \$3,500,000 of equipment trust certificates in connection with a loan from the Public Works Administration.

TEXAS & NEW ORLEANS.—*Consolidation Plan.*—The Interstate Commerce Commission has extended until May 10 the time within which this company shall accept the condition imposed by the commission in its report finding that the proposed consolidation of the Southern Pacific lines in Texas and Louisiana would be in the public interest.

Average Prices of Stocks and of Bonds

	Last Mar. 13	Last week	Last year
Average price of 20 representative railway stocks.	46.94	46.36*
Average price of 20 representative railway bonds.	78.97	77.73*

* Exchange closed because of Bank Holiday.

Dividends Declared

Beech Creek.—50c, payable April 2 to holders of record March 15.
 Boston & Providence.—\$2.12½, quarterly, payable April 2 to holders of record March 20.
 Old Colony.—\$1.75, quarterly, payable April 2 to holders of record March 17.
 St. Joseph, South Bend & Southern.—75c, semi-annually; 5 Per Cent Preferred, \$2.50, semi-annually, both payable March 15 to holders of record March 10.
 Vicksburg, Shreveport & Pacific.—Preferred, \$2.50, semi-annually; Common, \$2.50, semi-annually, both payable April 1 to holders of record March 8.

quarters, as announced in the *Railway Age* of March 10, page 364. A photograph of Mr. Ward is published herewith since that appearing last week in connection with the sketch of Mr. Ward's career was a photo-



Albert Ward

graph of C. E. Ward, auditor of passenger traffic of the Pennsylvania, which had been identified erroneously as a photograph of Assistant General Counsel Ward and submitted to *Railway Age* as such.

TRAFFIC

R. P. Sohan, general freight and passenger agent of the Frankfort & Cincinnati, with headquarters at Frankfort, Ky., has had his title changed to general traffic manager.

OBITUARY

W. H. Strachan, who retired as assistant to the vice president of the Northern Pacific, with headquarters at St. Paul, Minn., in 1933, died in Duluth, Minn., on March 12.

George A. Morton, former general baggage, mail and express agent for the New York, New Haven & Hartford, died in Hartford, Conn., on March 7 of heart disease, after an illness of several weeks. Mr. Morton was 79 years of age.

John D. Little, assistant general counsel of the Central of Georgia, with headquarters at Atlanta, Ga., died at his home near Albany, Ga., on February 25 after a long illness. Mr. Little was 63 years of age and had been a member of the law department of the Central of Georgia since 1892.

F. L. Wheaton, former engineer of construction on the Delaware, Lackawanna & Western, who retired from active service on June 30, 1930, died at his home in Buffalo, N. Y., on February 21, at the age of 72, after a short illness. Mr. Wheaton, who was born on October 25, 1861, entered the service of the Lackawanna on January 1, 1900, and during his long career with the road had been in charge of a number of important construction projects, the most important of which were the construction of the 28½ mile cut-off built by the Lackawanna Railroad of New Jersey between Hopatcong, N. J., and Slateford, Pa., and the 39½ mile cut-off constructed between Clark's ton.

Railway Officers

ENGINEERING AND SIGNALING

W. A. Guild, assistant chief engineer of the Eastern Lines of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., has been appointed division engineer of the Missouri division, at Marceline, Mo., succeeding **M. V. Holmes**, who has been assigned to other duties. The position of assistant chief engineer of the Eastern Lines has been abolished.

FINANCIAL, LEGAL AND ACCOUNTING

Albert Ward, assistant general solicitor of the Pennsylvania, with headquarters at Philadelphia, Pa., has been promoted to assistant general counsel with the same head-

THIRTY-SIXTH ANNUAL REPORT OF READING COMPANY FOR THE YEAR ENDED DECEMBER 31, 1934

PHILADELPHIA, PA., FEBRUARY 23, 1934.

To the Stockholders of Reading Company:

The Board of Directors submits herewith its 36th Annual Report.

INCOME ACCOUNT

For Years Ended December 31, 1933 and 1932

ACCOUNT	1933	1932
RAILWAY OPERATING REVENUES:		
Freight:		
Coal	\$24,475,980.01	\$25,138,349.22
Merchandise	19,400,315.81	19,439,298.49
Passenger	2,782,679.42	3,368,996.07
Excess baggage	2,205.05	3,681.75
Parlor and chair car	3,863.87	2,874.52
Mail	437,220.57	469,586.93
Express	386,207.76	458,445.81
Other passenger train	93,891.73	107,004.04
Milk	46,458.20	114,408.55
Switching	258,105.29	191,809.42
Special service train	907.00	3,471.75
All other transportation	335,612.17	339,254.48
Incidental and joint facility	1,240,605.23	2,169,193.03
TOTAL RAILWAY OPERATING REVENUES	\$49,464,052.11	\$51,806,374.06
RAILWAY OPERATING EXPENSES:		
Maintenance of way and structures	\$2,980,871.40	\$4,270,016.77
Maintenance of equipment	8,862,251.27	10,676,670.60
Traffic	830,107.39	912,493.61
Transportation	18,069,845.51	20,416,988.46
Miscellaneous operations	191,704.92	245,805.44
General expenses	2,217,823.49	2,296,826.33
Transportation for investment—Cr.	4,076.11	14,632.64
TOTAL RAILWAY OPERATING EXPENSES	\$33,148,527.87	\$38,804,168.57
Ratio of operating expenses to operating revenues	67.02	74.90
Net revenue from railway operations	\$16,315,524.24	\$13,002,205.49
Railway tax accruals	2,539,490.67	1,590,520.95
Uncollectible railway revenues	17,465.10	7,062.87
RAILWAY OPERATING INCOME	\$13,758,568.47	\$11,404,621.67
OTHER OPERATING INCOME:		
Hire of freight cars—Net	\$412,876.12*	\$545,393.59*

Other equipment rents—Net	189,431.62	66,917.64
Joint facility rents—Net	41,943.98	160,470.65
TOTAL OTHER OPERATING INCOME	\$181,500.52*	\$318,005.30*
NET RAILWAY OPERATING INCOME	\$13,577,067.95	\$11,086,616.37
NON-OPERATING INCOME:		
Miscellaneous rent income	\$541,022.58	\$629,991.47
Miscellaneous non-operating physical property	241,596.99	256,514.98
Separately operated properties—Profit	426,044.94	13,347.91
Dividend income	384,406.39	384,349.76
Income from funded securities	916,938.68	913,905.83
Income from unfunded securities and accounts	225,022.40	522,358.74
Income from sinking and other reserve funds	28,482.37	29,061.79
Miscellaneous income	12,199.23	11,175.01
TOTAL NON-OPERATING INCOME	\$2,775,713.58	\$2,760,705.49
GROSS INCOME	\$16,352,781.53	\$13,847,321.86
DEDUCTIONS FROM GROSS INCOME:		
Rent for leased roads	\$3,255,920.04	\$3,258,886.50
Miscellaneous rents	137,901.74	135,675.00
Miscellaneous tax accruals	191,305.60	191,676.34
Interest on funded debt	5,610,380.24	5,632,112.23
Interest on unfunded debt	80,613.73	64,350.31
Amortization of discount on funded debt	7,942.43	8,199.55
Miscellaneous income charges	353,195.22	327,632.93
TOTAL DEDUCTIONS FROM GROSS INCOME	\$9,637,259.00	\$9,618,532.86
NET INCOME	\$6,715,522.53	\$4,228,789.00
DISPOSITION OF NET INCOME:		
Income applied to sinking and other reserve funds	44,813.05	45,241.12
INCOME BALANCE TRANSFERRED TO PROFIT AND LOSS	\$6,670,709.48	\$4,183,547.88

Italics denote credits.

* Debit.

GENERAL BALANCE SHEET, DECEMBER 31, 1933

ASSETS	LIABILITIES		
INVESTMENTS:			
Investment in road and equipment	\$320,778,819.09		
Improvements on leased railway property	46,505,721.84		
Deposits in lieu of mortgaged property sold:			
Cash	\$1,087.62		
Securities	\$2,467,881.87		
Less company's securities	1,703,600.00		
	764,281.87		
Miscellaneous physical property	765,369.49		
	12,671,340.25		
	\$380,721,250.67		
Investments in Affiliated Companies:			
Stocks	\$45,896,252.18		
Bonds	11,899,404.56		
Advances	9,962,080.40		
	\$67,757,737.14		
Other Investments:			
Stocks	\$4,944,536.74		
Bonds	4,378,019.12		
Advances	491,188.85		
Miscellaneous	492,038.27		
	\$10,305,782.98		
Total Investments	\$458,784,770.79		
CURRENT ASSETS:			
Cash	\$3,080,286.69		
Special deposits	27,547.35		
Loans and bills receivable	117,771.66		
Traffic and car-service balances receivable	970,351.56		
Net balance receivable from agents and conductors	948,887.74		
Miscellaneous accounts receivable	1,226,820.87		
Material and supplies	5,240,836.65		
Interest and dividends receivable	477,593.45		
Total Current Assets	\$12,090,095.97		
DEFERRED ASSETS:			
Working fund advances	\$15,368.44		
Insurance and other funds	\$1,046,860.87		
Less company's securities	411,000.00		
	635,860.87		
Other deferred assets	265,997.35		
Total Deferred Assets	\$917,226.66		
UNADJUSTED DEBITS:			
Rents and insurance premiums paid in advance	\$44,012.85		
Discount on funded debt	393,533.45		
Other unadjusted debits	549,972.93		
Total Unadjusted Debits	\$987,519.23		
Grand Total	\$472,779,612.65		
STOCK:			
Book Liability	Held by or for Company		
First preferred	\$28,000,000.00	\$8,800.00	\$27,991,200.00
Second preferred	42,000,000.00	29,350.00	41,970,650.00
Common	70,000,000.00	10,900.00	69,989,100.00
Total Stock	\$140,000,000.00	\$49,050.00	\$139,950,950.00
LONG-TERM DEBT:			
Funded debt secured by mortgage	\$112,263,494.76	\$6,422,466.67	\$105,841,028.09
Funded debt secured by stock collateral	24,295,000.00	1,617,000.00	22,678,000.00
Equipment trust obligations	7,453,000.00		7,453,000.00
Total Funded Debt Unmatured	\$144,011,494.76	\$8,039,466.67	\$135,972,028.09
Non-negotiable debt to affiliated companies			320,040.50
Total Long-Term Debt	\$136,292,068.59		
CURRENT LIABILITIES:			
Traffic and car-service balances payable	\$1,319,477.65		
Audited accounts and wages payable	2,685,378.35		
Miscellaneous accounts payable	331,388.55		
Interest matured unpaid	1,747,246.85		
Dividends matured unpaid	46,193.72		
Funded debt matured unpaid	37,888.90		
Unmatured dividends declared	769,652.00		
Unmatured interest accrued	532,108.02		
Unmatured rents accrued	330,517.60		
Other current liabilities	17,039.29		
Total Current Liabilities	\$7,816,890.93		
DEFERRED LIABILITIES:			
Other deferred liabilities	\$230,096.32		
UNADJUSTED CREDITS:			
Tax liability	\$1,959,661.87		
Insurance and casualty reserves	664,186.72		
Accrued depreciation—Road	11,540,536.31		
Accrued depreciation—Equipment	67,217,621.13		
Other unadjusted credits	406,669.14		
Total Unadjusted Credits	\$81,788,675.17		
CORPORATE SURPLUS:			
Additions to property through income and surplus	\$103,151,194.17		
Funded debt retired through income and surplus	1,738,000.00		
Total Appropriated Surplus	\$104,889,194.17		
Profit and loss credit balance	1,811,737.47		
Total Corporate Surplus	\$106,700,931.64		
Grand Total	\$472,779,612.65		
CHARLES H. EWING, President.			

[Advertisement]



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BARCO Low Water Alarms are guarding hundreds of locomotives and their crews against disaster from low water conditions. Installations have been made on a good percentage of the modern power built during the last five years.

Railroads have discovered that the BARCO Low Water Alarm is a good paying investment as well as a dependable sentinel when danger threatens.

Thousands of dollars are being saved annually through the elimination of those brief periods of low water conditions which damage crown sheets and crown bolts.

Evidence of still greater maintenance savings has been uncovered which shows that the BARCO Alarm inspires confidence, allays fears and thus eliminates those high water levels which are so destructive to many locomotive parts.

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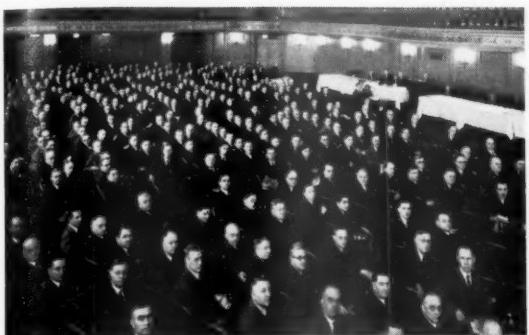
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BARCO *Low Water* ALARM

Always Functions When Low Water Threatens

Railway Engineers Meet at Chicago



Report of the annual convention of the American Railway Engineering Association, held on March 13-14.



Report of the annual convention of the Signal Section, American Railway Association, held on March 12-13.

A pictorial review of current developments in appliances and materials used in railway construction, maintenance and signaling.

Advertisements of manufacturers who would normally have participated in the annual exhibit of the N. R. A. A. if it had been held.



A.R.E.A. Holds Annual Meeting in Chicago



W. P. Wiltsee
President

Two-day convention stresses
importance of research and
outlines program for more
intensive work in the future



J. E. Armstrong
President-Elect

RESEARCH, as applied to the construction, maintenance and operation of the railroads, was the dominant note of the thirty-fifth annual convention of the American Railway Engineering Association, which was held at the Palmer House, Chicago, on Tuesday and Wednesday of this week. The place that the association has had in this field was clearly set forth by President W. P. Wiltsee, chief engineer of the Norfolk & Western, in his address during the opening session, when he declared that, "We have been engaged for years in research work of a high degree and the application of its results to our engineering problems."

Research as Applied to Railroading was the subject of an address by Dr. A. A. Potter, dean of engineering, Purdue university, at the association's luncheon on Wednesday noon, while the session on Tuesday evening was devoted to the presentation of informal reports by Dr. A. N. Talbot and Prof. H. F. Moore of the University of Illinois, on the progress made in the research projects which they are conducting under the sponsorship of the association, namely, Stresses in Railroad Track, and the Joint Rail Investigation.

Announces New Research Staff

President Wiltsee also announced the plans being made for a more intensive prosecution of research through arrangements that have been made to establish a director of research and staff, functioning directly under a special research committee, to work with and direct experiments and other scientific research work that may be required by the standing committees. He referred also to the work of the Committee on Stresses in Railroad Track. "This committee," he said, "has produced information that will be very valuable in its application to the design of our track structures. This committee should be continued and its work extended. During the past year the Committee on Rail Investigations has presented information that is worth a great deal to the railroads, in that their experiments have shown at least one cause to which transverse fissures in rails can be traced, and how they develop in track under heavy wheel loads."

Commenting on other plans of the association, he called attention to the creation of the Special Committee on Design for Complete Roadway and Track Structure,

with instructions to study and report on "Complete roadway and track for various loads and traffic densities." Numerous changes and additions to the trackwork plans in recent years have made it necessary to reprint the portfolio and bring the volume up to date. The Track Committee has accordingly given this matter intensive study during the year and the revised portfolio will be made available to the members as soon as practicable after the annual meeting. He also referred briefly to the extensive revision of trackwork plans by the Committee on Track.

In conclusion, he offered a number of specific recommendations having to do with the conduct of the association's work, of which the most important was an amendment of the constitution providing for letter ballot approval of matter offered for inclusion in the Manual.

The secretary reported a net membership of 2,028 on March 1, 1934, compared with 2,311 on March 1, 1933. The excess of receipts over disbursements during the past year was \$3,964.99. The registration showed an attendance of 510 members and 198 guests, approximately 16 per cent larger than that of last year.

At a luncheon on Wednesday, A. A. Potter, dean of engineering, Purdue university, spoke on research as applied to railroading, in which he paid tribute to the large amount of constructive work which the railways have done in developing materials and practices and the equally constructive work which railway supply companies have done in developing and perfecting equipment and materials for use by the railroads. He then emphasized the necessity for a greater co-ordination of this research by men especially selected for their ability in this line. He advocated a central laboratory, preferably in connection with some leading educational institution where the surroundings and the facilities would be conducive to thorough research.

New Officers

The following officers were elected to serve for the ensuing year: President, J. E. Armstrong, assistant chief engineer, C. P. R., Montreal, Que.; second vice-president, A. R. Wilson, engineer of bridges and buildings, Penna., Philadelphia, Pa.; secretary, E. H. Fritch (re-elected); and treasurer, A. F. Blaess (re-elected), chief engineer, I. C., Chicago. The following were elected to

serve as directors for three years: R. C. Bardwell, superintendent of water service, C. & O., Richmond, Va.; W. J. Burton, principal assistant engineer, M. P., St. Louis, Mo.; and E. L. Crugar, chief engineer, Wabash, St. Louis, Mo. In addition, R. H. Ford, assistant chief engineer, C. R. I. & P., Chicago, was automatically advanced from second vice-president to first vice-president.

Records and Accounts

C. C. Haire, Chairman*

The work of the committee was divided into five subdivisions: Miscellaneous matters; general railway engineering reports and records; maintenance of way reports and records; valuation; and accounting practices affecting railway engineering. Following are references to the specific subjects given consideration in these groups.

Office and Drafting Room Practices—Last year the committee submitted a group of revised graphical symbols covering engineering and office practice to replace those symbols appearing in the Manual. These revised symbols, further revised during the year, were submitted for adoption. Together they involved 17 sheets and covered 34 specific subjects.

These symbols were all adopted with the exception of the sheet on Track Fixtures, which the committee withdrew, and a revision of the sheet on Bridge Rivets, accepted by the committee at the request of A. R. Wilson, (Penn.), to eliminate dimensions of rivet heads.

On the recommendation of the committees on Signals and Interlocking, and on Electricity, the committee reported that it has discontinued its effort to prepare a pamphlet covering electrical and signal symbols.

Joint Facility Records—The committee considered the subject under three heads: (a) Appraisal methods and records for keeping up-to-date; (b) maintenance and operation reports and records; and (c) effect of depreciation accounting. It pointed out the present trend toward the elimination of duplicate facilities and the unification of small differently-owned properties into larger operating units, and the greater importance of suitable methods and forms which will enable roads to maintain records readily of changes in jointly-used property, and assist in compliance with agreements.

It was recommended that the report be received as information and the subject discontinued.

Bridge Inspection Report Forms—After several years' effort, the committee arrived at and submitted this year for publication in the Manual (with the approval of the four committees with which it has collaborated) three forms for making bridge inspection reports. These forms, which were included in the report as Exhibits 1, 2 and 3, are designated as Form 1110 Revised, Form 1110-A, and Form 1110-B. The first covers masonry and steel bridges and trestles; the second covers wooden box and pipe culverts; while the third is a summary report which may be compiled from the daily inspection reports.

It was recommended that the new forms supersede Forms 1110 and 1111 now in the Manual, and that the subject be discontinued. The recommendation was approved.

Statistical Requirements—Under the subject of statistical requirements of operating, accounting and other departments with respect to maintenance of way and structures, the committee submitted as information one form covering the recapitulation and distribution of material.

Forms Used by Water Service Department—The committee recommended the adoption of four forms which it has submitted to the association during the last three years, these covering: Cost of water production; monthly report of water station operation; quarter monthly report of water treating plant operation; and record of water station facilities. It also recommended the withdrawal of Forms Nos. 1302 and 1301 from the Manual; that the new forms be published in that section concerning records and accounts, with suitable reference notes in the section covering water service; and that the subject be discontinued. The new forms were all adopted.

Methods and Forms for Keeping Up-to-Date Valuation and Other Records—In a brief report, the committee pointed out how the Emergency Transportation Act of 1933 has affected valuation procedure, and then proceeded to make a number of observations and recommendations with regard to the maintenance of certain valuation records.

Edwin F. Wendt, consulting valuation engineer, discussed this subject at length, pointing to the change in the popular understanding with respect to the capitalization of the railways since

the Valuation Act was passed, but he contended that the changes in valuation procedure growing out of the Emergency Transportation Act of 1933, do not in any way decrease the importance of this phase of the committee's work.

Recapture Proceedings—The committee called attention to the repeal by Congress of the recapture clause of the Transportation Act, and recommended that the subject be discontinued.

Depreciation Charges of Steam Railways—The committee merely reported that the situation with respect to depreciation accounting remains unchanged from that reported at the last convention, and that it is continuing the development of recommended procedure under the provisions of the tentative draft of the classifications and proposes to bring that recommended procedure into line with the final text of the classifications as soon as it is published.

Simplifying and Co-ordinating Work Under Requirements of I. C. C.—The committee stated that the situation with respect to submitting a final report remains practically as reported last year, in spite of its effort, which it outlined, to secure recognition of the association as a carrier agency. The committee also called attention to the effects on the railways of the various changes in Federal regulation during the year, and the work of the Committee on Valuation Accounting of the Accounting Officers Association in attempting to secure reductions in valuation requirements.

Bibliography—The committee presented a bibliographical review of books and articles appearing from November, 1932, to October, 1933, having to do with subjects with which it is concerned.

Revision of the Manual—The committee recommended the withdrawal from the Manual of certain paragraphs under the heads of Appraisals, Valuation Records and Accounting; Labor and General Forms; and Cost-Keeping Methods, Statistical Records, and Forms for Analyzing Expenditures for Assistance in Controlling Expenditures. These revisions were adopted.

Other Subjects—The committee reported progress in its study of the following subjects: System of report and records required to budget and control maintenance of way expenses; changes or revisions in I. C. C. classification of accounts; and recommended practice to be followed in preparing data for rate and other cases with respect to valuations, allocation of operating and maintenance costs to various zones, and allocation of costs to specific services performed.

Shops and Locomotive Terminals

J. M. Metcalf, Chairman*

Four subjects were reported upon at some length by the committee, which also gave consideration to three other subjects on which it reported progress.

Turntables—The 10 conclusions submitted last year by the committee as a result of its study of turntables were approved at that time for publication in the Manual, with the exception of No. 3, which referred to the method of installation of power-operated turntables. The original recommendation indicated a preference for the installation of wiring to turntables in underground conduits. To ascertain present practice on the railways, a questionnaire was sent out and, of the 58 roads reporting, 8 expressed preference for underground connections, while 48 reported preference for overhead connections and 2 roads were non-committal. Following a discussion of the reasons prompting the preference, the committee offered the following revised conclusion No. 3, which it recommended for adoption:

Where modern locomotives are to be turned, mechanical power for operating the turntables should be provided. Where current is available, electricity is the most reliable means of operating a turntable. The power wires may be led to the table either overhead or underground. In either case, care should be taken to see that the installation is made so as to minimize the danger of interruption in case of fire, storm, inadequate drainage or other emergency. Where electric power is not available, a compressed air motor may be used. This was adopted without comment.

Power Plants—In considering this subject, which was new this year, the committee interpreted the assignment to cover the present practices of representative roads in power plant operation and maintenance and as regards recommended capacity at important locations. From the answers received to a questionnaire, the committee prepared a progress report under the following heads: Plant size, fuel, generator sets, air compressors, water supply pumps, steam heating, facilities served by air compressors, lighting supplied from plant current, steaming locomotives after fires are dead, per cent of boiler capacity used in heating, per cent of boiler capacity for generating electricity,

*Auditor Capital Expenditures, Illinois Central.

*Assistant Chief Engineer, Missouri-Kansas-Texas.

per cent of boiler capacity for operating air compressors, use of supply pumps, per cent of total water consumption, relative cost of electric current, receiving and distributing substations, transmitting methods, and supporting structures for overhead construction.

Wheel Removing Equipment for Engine Houses—The report on this subject was essentially a discussion of the evolution of drop pit equipment, beginning with the early days of railroading when locomotives were raised by means of jacks and blocking for the removal of wheels, and continuing down to the modern, four-screw, electrically-operated, drop pit table with such improvements as nested tops and swing gates. In the latter half of its report, the committee discussed the special points of advantage of the modern table, the general requirement for the design and construction of drop pits, and factors to be taken into consideration in the selection of a drop table.

Car Paint Shops—The report was a summary of the replies made by 30 roads to a questionnaire sent out by the committee, and covered, among other things, shop design, capacity, layout, construction, electrical wiring, fire protection, methods of painting, and methods of paint storage.

Other Subjects—The committee reported progress on three subjects: Welding equipment installations as applied to shops and locomotive terminals; general reclamation plants; and car wheel shops.

Water Service and Sanitation

R. C. Bardwell, Chairman*

The committee presented detailed reports on five subjects, which it submitted as information, and reported progress on four other assignments.

Pitting and Corrosion—Finding that there have been no important developments in the theoretical aspects of this subject since its last report, the committee reviewed its past work and made an effort to collect information from representative roads as to the present status of pitting, to ascertain what methods have proved most successful in actual service. It referred to its own formula for producing caustic alkalinity in boiler water and stated that practically every road that has used the formula under competent supervision, has succeeded in greatly reducing the damage sustained on account of pitting and corrosion.

The report also referred to the use of corrosion-resisting alloys in manufacture of boiler tubes, flues and sheets, and discussed the importance and methods of protecting the boilers of stored locomotives against damage by pitting and corrosion.

Methods and Value of Water Treatment—During the year the committee endeavored to place monetary value on various methods of water treatment, and to investigate the increased life of locomotive boilers, in spite of the reduced forces and shop expenses which have prevailed. To ascertain if any of this increased life or savings could be attributed to water treatment, study and comparison were made of recent expenditures for strictly mechanical repairs and for boiler repairs. This disclosed that boiler repairs showed greater reduction than 24 per cent mechanical repairs, as compared with normal operating conditions. Information collected also showed how roads using treated water have increased the interval between boiler washings.

The committee reported that possibly the most gratifying results shown on all of the larger railroads during the last year have been in the increasing number of extensions granted by the Federal Bureau of Steam Locomotive Inspection, for locomotives that have operated the four-year period, and which, because of the excellent condition of the flues and boiler sheets, are in condition to operate an additional year. It pointed out that if it had not been for the use of suitable boiler water, these extensions would not have been possible, and also, that the savings which have been effected as a result of these extensions offset the investment in water softening facilities in a short time. The committee expressed its belief that the water treating facilities now in use on the railways have proved to be one of the main factors in enabling them to operate as satisfactorily as they have under the adverse circumstances which have prevailed.

Pipe Joints—The committee presented a concise history of pipe and pipe joints, dating back to the first efforts to transport water about 3000 B. C.

Following a discussion of the earliest developments, the committee carried forward the history under the following heads: Joints and their development; screw points for wrought, steel and cast iron pipe; cast iron screw joints; screw flanged joints for wrought or steel pipe; riveted joints for wrought or steel pipe; welded joints of wrought and steel pipe; welded cast iron

pipe; bell and spigot joint cast iron pipe; mechanical cast iron pipe joints; cast iron bell joint clamps; fire hose couplings; Transite pressure pipe and couplings; and reinforced concrete pressure pipe.

Essentials of Mosquito Control—This report discussed the reasons for and the importance of mosquito control, and the desirability of the railways taking part in this work, especially roads in those sections of the country where malaria fever is prevalent and so easily carried by these insects. The committee pointed out the great loss of production, time and labor on the roads of the South because of malaria among employees, and, by percentages, showed the extent to which the different classes of railway employees have been affected by this disease, transmitted largely by mosquitoes. It then discussed the efforts of certain roads in mosquito control, showing the different methods employed by 15 roads operating in the South and Southwest.

Disinfectants, Fumigants, and Cleaning Materials—Because of the wide scope of this subject, the varied materials and usages of these materials involved, and the sizable costs to the railways in the use of disinfectants, fumigants and deodorants, the committee expressed the belief that this subject warrants extended investigation on its part. It said that a complete report on this subject, to be of value to the railways, must contain definite instructions concerning the use of the various materials, describe the compounds used for each particular purpose and detail the methods for their successful use economically, the committee promised to take up these phases in subsequent reports. The report for this year consisted of a general outline of the scope of the subject, a differentiation of the terms "disinfection," "deodorization" and "fumigation," and a digest of the more common compounds for the purposes required.

Other Subjects—The committee reported on the following assignments: Revision of the Manual; the design and maintenance of track pans for locomotive water supply; methods of analysis of chemicals used in water treatment; and the progress being made by Federal or state authorities with regulations pertaining to railway sanitation.

This report was accepted without discussion.

Rules and Organization

E. H. Barnhart, Chairman*

Collaborating with appropriate committees, the committee gave initial or further consideration to a large number of rules for the guidance of employees in the maintenance of way department.

Maintenance of Masonry Bridges—With the approval of the committees on Masonry and on Iron and Steel Structures, the committee offered for adoption and publication in the Manual, the 15 rules given below, relating to the maintenance of masonry bridges. These rules correspond to similar rules submitted at the convention last year, and returned to the committee for further consideration.

1150—Driftwood or other debris must not be permitted to accumulate around the base of bridge masonry.

1151—All obstructions to proper drainage in the channel must be removed. If obstructions are caused by a faulty channel, changing the channel should be given consideration.

1152—Where scouring or undermining of the bridge masonry is found, riprap or other forms of protection must be installed.

1153—Where foundations are badly undermined or otherwise endangered, protection shall be provided for the structure.

1154—Where examination reveals weakness of the masonry from any cause, such conditions must be reported.

1155—Where arches or culverts are subjected to excessive scouring or undermining, protection must be provided.

1156—Where masonry is subjected to the action of ice or other abrasion causing disintegration, protection work of proper design must be installed.

1157—Where masonry is founded on timber, previously under water, which subsequently becomes exposed to the air, a proper foundation must be substituted.

1158—Where movement has become restricted at expansion joints, they must be repaired to allow the joints to function as designed.

1159—Where indication of failure of arch rings occurs, as evidenced by cracks or flattening of the arch, temporary support must be provided until permanent repairs can be made.

1160—Drains or "weep holes" in bridge masonry must be kept open to insure full operation of the drainage system.

1161—Inadequate drainage of bridge masonry must be remedied.

1162—Bridge seats that have become weakened through deterioration or overload must be replaced.

1163—Areas of masonry that have become deteriorated must

*Asst. Div. Engr., Baltimore & Ohio.

be repaired prior to reaching an extent endangering the strength of the structure.

1164—Joints in stone masonry must be kept well pointed. Before pointing, all loose material must be removed and the joints well moistened. These rules were adopted for publication in the Manual.

Telegraph and Telephone Lines and Appurtenances—Collaborating with a committee appointed by the Telegraph and Telephone section, the committee presented 41 rules covering outside communication plants, which are based upon specifications and instructions contained in the Manual of Recommended Practice of the Telegraph and Telephone section, and intended for the guidance of maintenance of way employees. The rules, which were submitted for criticism and suggestions, included 17 under the head of clearances; 11 under the head of underground construction; and 13 of a general nature.

Titles for Assistant Eng'neer—At the 1933 convention, in an attempt to clear up the confusion which surrounds the general term "assistant engineer," the committee presented for criticism 19 appropriate titles for engineering assistants in various departments who are generally called assistant engineers. This list, which gave the duties of the positions, the persons to whom report is made, and the proposed titles, was submitted this year for inclusion in the Manual, the committee having received no suggestions or criticisms pertaining to any of the titles. These titles were approved for publication in the Manual.

Rules for Fire Prevention—Last year the committee presented as information a number of rules on fire prevention as applied to the maintenance of way department, which were submitted with the approval of the National Board of Fire Underwriters. These rules, which point out the specific duties of division engineers, supervisors of track, supervisors of bridges and buildings and supervisors of water service, were revised and rearranged during the year to meet certain criticisms, and were presented to the convention for adoption, with the approval of both the National Fire Underwriters and the Railway Fire Protection Association. There were 17 rules. These rules were approved for publication in the Manual.

Revision of Manual—The committee proposed revisions in two rules in the Manual governing the inspection of bridges, trestles and culverts, and also recommended the withdrawal of the existing rule designating the specific type of form to be used by bridge field inspectors in reporting inspections. These revisions were approved.

Uniform General Contract Forms

F. L. Nicholson, Chairman*

During the year, collaborating with other committees and bodies, the committee brought to completion several forms for the consideration of the association, two of which it recommended for adoption and inclusion in the Manual.

Form for Purchase of Electrical Energy in Large Volume—Bringing to conclusion work of several years in preparing a form of agreement for the purchase of electrical energy in large volume, the committee presented such a form for adoption and publication in the Manual. In submitting the form, the committee stated that it had had the valuable and whole-hearted collaboration of the Electrical section through a sub-committee appointed for the purpose. Furthermore, authorities from both the production, or selling, side and the using, or purchasing, side had been consulted, and many suggestions were received which influenced the terms and conditions written into the completed form. This form was adopted for inclusion in the Manual.

Form for Right to Construct and Maintain Buildings Over Railway Property—The committee submitted as information to invite suggestions and criticism, a carefully prepared form for the conveyance of title granting the right to construct and maintain buildings over railway property. In drawing up this form, the committee stated that it had given careful study to all available contracts and conveyances, to the end that the proposed form would be the most inclusive and effective. While the form takes into consideration all of the factors which may normally arise between the grantor and the grantee, the committee offered a number of suggestions for additions to the form to cover special conditions which may apply in specific cases or in certain localities.

Form for Pipe Line Crossings and Pipe Lines on Railway Property—Originally the committee was directed to prepare a form of agreement for pipe line crossings under railway tracks and a separate form of agreement for the use of railway property by pipe lines paralleling the railway, with special reference

to pipe lines carrying high pressure inflammable oils and gas. However, early it came to the conclusion that one form could be prepared to cover both subjects, so it worked to that end, collaborating with the committees on Roadway and on Water Service and Sanitation, and with a special committee of the American Petroleum Institute. The form resulting, which was presented as information at last year's meeting, was submitted for adoption and publication in the Manual. This form was adopted for inclusion in the Manual.

Form of Agreement With Public Authorities for Highway Grade Crossing Elimination or Separation—Collaborating with the Committee on Grade Crossings, the committee prepared a form of agreement as directed, which covers both overhead and underpass grade separations. It expressed the feeling that the form as prepared is complete and worthy of acceptance at the present time, but, in line with usual practice, it submitted the form as information to invite suggestions.

Revision of the Manual—The committee made no recommendations for revision of the Manual.

Report on Buildings

G. A. Rodman, Chairman*

The committee gave consideration to ten subjects during the year, reporting in detail concerning five, and progress on the other five.

Revision of Manual—The committee recommended major changes in the Manual, in the form of revised specifications for built-up roofing. The specific specifications involved, which are to replace Pages 319 to 327—Section 10D, cover Built-up Roofing; Type A-1, Tarred Rag Felt, Pitch and Gravel (or Slag) Over Wood or Pre-Cast Units; Type A-2, Tarred Rag Felt, Pitch and Gravel (or Slag) Over Homogeneous Roofs Cast in Place; Type B-1, Asphalt Rag Felt, Asphalt and Gravel (or Slag) Over Wood or Pre-Cast Units; Type B-2, Asphalt Rag Felt, Asphalt and Gravel (or Slag) Over Homogeneous Roofs Cast in Place; Type C-1 (Class 2), Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Wood and Pre-Cast Units; Type C-1 (Class 3), Asphalt Saturated Rag Felt, Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Wood or Pre-Cast Units; Type C-2 (Class 2), Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Homogeneous Roofs Cast in Place; and Type C-2 (Class 3), Asphalt Saturated Rag Felt, Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Homogeneous Units Cast in Place. All of the revisions were approved.

Specifications for Railway Buildings—Under this assignment, the committee submitted six new specifications as information, and recommended for adoption and publication in the Manual, specifications for electrically-operated freight or baggage elevators, submitted last year and published in the Proceeding for 1933. The new specifications presented, which were offered for information and criticism, are as follows: The specifications for elevators were adopted.

Section 30D, Steel Chimneys—Welded; Section 30E, Genuine Wrought Iron Chimneys; Section 10-D, Built-up Roofing, Type C-1 (Class 1), Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Wood or Pre-Cast Units; Built-up Roofing, Type C-2 (Class 1), Asphalt Impregnated Asbestos Felt and Asphalt (Smooth Surface) Over Homogeneous Roofs Cast in Place; Section 31-A, Wood Screens; and Section 31-B, Metal Screens.

The committee reported that it has in course of preparation a specification for genuine wrought iron chimneys—welded, and, under consideration, the preparation of a specification for reinforced brick chimneys. It also stated that it is considering revisions in the specifications for asphalt impregnated felt roofing over wood or pre-cast gypsum and over concrete or poured gypsum, Section 10-D, Types D-1 and D-2, appearing in Bulletin 323, January 1930.

Relative Merits of Wood and Fireproof Roof Structures—The report on this subject was presented under five heads covering the principal types of roof deck construction—(1) Wood decks; (2) Decks of various non-combustible materials in sheets, on steel purlins; (3) Concrete decks; (4) Reinforced gypsum decks on steel purlins; and (5) Long span interlocking concrete slabs or interlocking cast iron plates. Under (1), the committee included wood sheathing or decking of various thicknesses on various types of rafters, beams and purlins. Under (2) it included both black and galvanized corrugated sheets of various materials. Under (3) it included various types of slabs, both flat and supported on beams. Under (4) it covered both poured-in-place and pre-cast slabs. And under (5) it included both interlocking concrete slabs and interlocking

* Chief Engineer, Norfolk Southern.

* Gen. Supr. B. & B., New York, New Haven & Hartford.

cast iron plates on unprotected steel purlins. Supplementing a statement of the relative merits of the different forms of construction, the committee presented the same data in tabular form, using numerals 1 to 3 to indicate the relative rating of each as regards the different points taken into consideration.

Dust Explosions in Grain Elevators—Following a general discussion of the causes and hazards of dust explosions in grain elevators, in which reference was made to the earlier work and reports of other interested organizations and associations, the committee presented a detailed discussion of methods of obviating the hazard, and then summarized its findings in a group of concisely worded conclusions. In these, it pointed out that the hazard of dust explosions can be reduced by (1) Good housekeeping to prevent the accumulation of static dust; (2) Dust-tight electric equipment; (3) Plenty of ventilation to prevent the atmosphere from becoming charged with explosive dust; and (4) Dust collection by fan-produced suction, to remove dust in suspension at all times where grain is agitated.

Remodeling Freight Houses for Door-to-Door Delivery—As a result of its study of this subject, the committee came to the conclusion that the average present-day freight house, with its tail-board space, with or without a platform, should meet the requirements of door-to-door freight service without the necessity for remodeling. It recommended, therefore, that its present short report be accepted as final and the subject be discontinued.

Other Subjects—The committee reported progress on the following subjects: Bus terminal buildings, isolated and in conjunction with railway stations; application of stainless and rust-resisting metals to building construction; vermin and rat-proofing in buildings; mill type and other heavy wood construction for railway buildings; and the economic value of various basic and composite materials used in building construction and maintenance.

Report on Rail

Earl Stimson, Chairman*

The committee made detailed reports on 10 subjects dealing with rail and related matters, and called attention to the new designs for 112-lb. rail and 112-lb. rail joint bar which it submitted to the members during the year for adoption by letter ballot.

Redesign of Rail Sections Heavier Than 100 Lb. Per Yd.—As the result of the demand for the early adoption of a revised rail section whose weight would lie between that of the 130-lb. R.E. section adopted at the 1933 convention and the existing standard 100-lb. R.E. section, the committee developed a section weighing 112 lb. per yd. and submitted it to the association for adoption by letter ballot on June 1, 1933. It reported that the new section was adopted by a large majority.

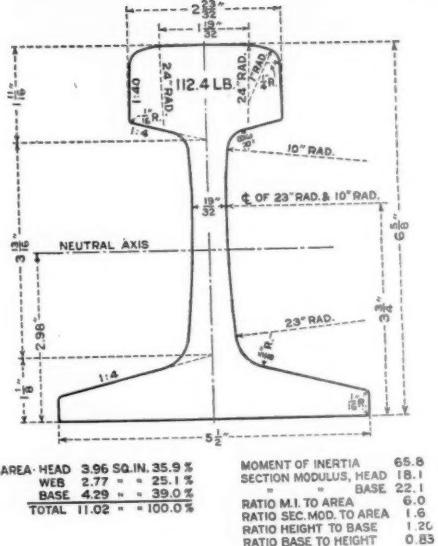
As a matter of record, the committee included in its report the data which accompanied the letter ballot to the members, which consisted of a letter of transmittal, arguments in favor of the adoption of the 112-lb. R.E. section, a drawing of the section, and the recommendations submitted for approval.

Design of Joint Bars—This assignment, with specific reference to the development of a design of a joint bar section and assembly for use with the new 112-lb. R.E. rail section recommended by the committee, was added to the work of the committee during the year, with the request for early action. As a result, the committee developed a new bar section and joint assembly, which, to secure early adoption, it submitted to the association by letter ballot on January 20, 1934. The letter ballot resulted in the adoption of the 112-lb. joint bar and assembly by a vote of 444 to 160.

Following favorable action on the joint bar for the 112-lb. rail, the committee sent out a supplemental report submitting a similar design for a joint bar and assembly for the 131-lb. rail, recommending adoption of the design and of a standard drilling for the bar and the rail. However, when Chairman Stimson presented this part of the report, he said that the committee had found it advisable to withdraw the design of the joint bar section. As a result, only the recommendations as to the punching of the bars, the drilling of the rails, and the assembly as a whole, exclusive of the section of the bar, were offered, and they were accepted without comment.

Revision of the Manual—The committee proposed a number of revisions in the Manual, mostly minor in character, these coming under the five heads, as follows: Definitions, rail specifications, drilling of rails, specifications for high carbon steel and for quenched carbon steel joint bars, and revisions in Form 402A, having to do with reporting individual rail failures in main track. These changes were all accepted without comment.

* Chief Engineer Maintenance, Baltimore & Ohio.



112-lb. R. E. Rail Section

Rail Mill Practice and Manufacture—The committee reported substantial progress in the joint investigation under way by the Rail committee and the Rail Manufacturers' Technical committee to determine the cause and remedy for transverse fissures and other rail failures. It said that the laboratory work at the University of Illinois is continuing, but that greater emphasis is now being placed on the field tests that were initiated on the B. & O. and the A. T. & S. F. No specific details of the tests were given.

Rail Failure Statistics for 1932—In this report, as in the past, data concerning rail failures were presented by W. C. Barnes, engineer of tests for the committee. The statistics presented, which were brought up-to-date as of December 31, 1932, were compiled, as formerly, in accordance with the standard method of basing the failure rate on mile years of service in track. As in the past also, the report contained an analysis of rail failures with respect to the rollings by different mills, and a number of tables, diagrams and charts showing various trends in failure rates.

Transverse Fissure Statistics—The report on this subject, again prepared by W. C. Barnes, was a complete review of the transverse fissure situation, brought up to date and presented largely in tabular and chart form. The accumulated grand total of fissure failures, service and detected, reported up to December 31, 1932, from all rollings, was 65,281, or an addition during the year of 7,054. This is 427 less than were reported in 1931. The decrease, the report said, is accounted for by a reduction of 171 service failures and 256 detected failures during the year. Attention was called to the fact that this is the first time since 1924 that there has been a decrease in total service and detected failures. It was pointed out that the decrease reported was due, no doubt, to detector car operation during 1932 and previous years, and to decreased traffic.

A. R. A. Rail Fissure Detector Car—The report, prepared by W. C. Barnes, showed that, under the direction of the committee, the A. R. A. detector car had tested approximately 6,600 miles of tracks during 1933, bringing the total track miles tested during its five years of operation to 23,181 miles. Mr. Barnes reported there had been no change in the per diem rental charge of \$85 a day for the car, but that, owing to improvement in testing methods, speeding up operations, more miles were being tested a day, with a substantial reduction in the cost per mile tested. It was reported further that there is still a demand for the services of the car, and that the A. R. A. has approved the purchase of a more substantial car in which to house the detector equipment.

Rail Batter and Heat Treatment of Rail Ends—The committee listed the various factors which accelerate rail end battering, and then devoted the remainder of its report to a discussion of the different methods of heat-treating the ends. It recommended that the heat treatment of rail ends be followed generally in the case of new and cropped rail, and where rail batter has not progressed to an objectionable extent. Among other recommendations, it urged extensive tests of heat treating by the railways.

Economic Value of Different Sizes of Rail—The committee reported much work on this subject, but withheld a detailed report because of lack of agreement as regards the quantitative value, expressed in money, of the effect of the size of rail on the track structure.

Tail Lengths in Excess of 39 Ft.—As the result of a questionnaire, the committee found that 37 roads of a total of 63 replying, expressed a preference for the present standard rail length of 39 ft. The other 26 roads expressed a preference for seven other lengths varying from 45 ft. to 79 ft. In view of this situation and the large expense that would result to the rail mills in an appreciable lengthening of the standard rail, the committee recommended that the subject be discontinued for a time.

Tests of Alloy and Heat-Treated Carbon Steel Rails—Following a tabulation by roads and mills of the amount of intermediate manganese steel rails that has been purchased by the railways, brought up to include 1933, when only one road purchased 21,235 tons, the report consisted of a summary of the answers to questionnaires submitted to the different roads concerning the results being obtained with intermediate manganese steel rails; the heat-treatment of rails in general; and the heat-treatment of rail by the Bethlehem "lead bath" process.

As regards the heat treatment of rails, the committee came to the conclusion that as a result of the increased toughness brought about, the heat-treated rails are abraded less than untreated rails in the ratio of 1 to 1.78; Furthermore, that both the length and severity of batter at the rail ends is slightly greater on untreated rails.

The presentation of the committee's report was concluded with a lantern slide lecture by Prof. H. F. Moore, University of Illinois, who gave an informal progress report on the current status of the Joint Rail Investigation. This work, he said, had been carried far enough to warrant a review of certain observations. Laboratory tests of rails under repeated flexure tests with rolling loads develop transverse fissures if shatter cracks are present, but in rails free from shatter cracks, failure follows the formation of cracks on the surface and this under stresses much higher than are required to form fissures in shatter-cracked metal. The development of transverse fissures in laboratory tests cannot be effected by bending alone; it is necessary to simulate the effect of a rolling wheel load on the top of the rail head, although heavy bending stresses accelerate the growth of the fissure. The effect of the high bearing pressures on the surface of the rail is explained by the high shearing stresses which they develop in the head. The conclusions, based on laboratory work, are supported by data obtained in the examination of many rails that had developed fissures in service. Shatter cracks have been found in all such rails.

Having established the fact that the action of wheel loads on rails will develop transverse fissures in rails in which there are shatter cracks, not infrequently under loads as low as 37,000 lb., the investigation was turned to the determination of the magnitude of the wheel loads imposed in service, including the impact effects of flat spots, drive wheel over-balance, etc. Observations were taken of some 50,000 wheels in moving trains, employing the methods developed by Dr. A. N. Talbot, and it has been found that the actual loading effect is not infrequently two or three times the nominal static load. There was one record of 60,000 lb., several of 40,000 lb., and a considerable number over 30,000 lb. In general, one-half of one per cent of the loads were in excess of the 37,000 lb. load that is known to produce fissures.

Prof. Moore said that it is proposed to make extensive investigations of various processes that are being advanced for the controlled cooling of rails in the mill to ascertain, if possible, whether they are of any benefit in eliminating the formation of shatter cracks. In commenting on the tests of rail for acceptance under specifications, he criticised the drop test because,

as now specified, the head is up, thereby subjecting it to compression rather than tension, and because the test specimen is subjected to more rapid cooling than the rest of the rail. There is a need, he said, for a form of test that does not involve the destruction of selected specimens, because such tests do not insure soundness of the product not subject to test. He reported that studies are being made of all possible types of non-destructive tests, but thus far no practicable method has been discovered.

Report on Yards and Terminals

M. J. J. Harrison, Chairman*

Continuing its work of past years, the committee made detailed reports on five subjects; recommended two major additions to the Manual and one deletion; and reported progress in its study of the co-ordination of facilities at rail and water terminals.

Grain Elevator Storage Yards and Tracks—The report on this subject was based on an analysis of the replies to a questionnaire sent to 47 roads. The committee discussed briefly the functions of large grain elevators and pointed out that there are three general types of elevator plants, each located geographically with respect to the class of traffic handled, viz.: (1) The rail-to-rail plant, where grain is received by rail for storage and subsequently reshipped by rail; (2) the rail-to-water plant, where grain is received by rail for storage and later reshipped by boats; and (3) the water-to-rail plant, where the grain is received from boats for storage and reshipped by rail. It pointed out, however, that specific plants may be combinations of these types.

The principal part of the report dealt mainly with the track layouts at the three different types of elevator plants, including storage yards. At the end of the report, following a number of general remarks concerning certain special track facilities, the committee included, as information, a statement showing the characteristics of 47 grain elevators served by railroads in the United States and Canada. It also included a plan of a rail-to-rail plant with separate storage yard, and a plan of a rail-to-water plant layout.

Hump Yards—Last year the committee submitted as information a report covering what is termed the graphic method of designing gradients in connection with the application of car retarders to hump yard operation. Two methods, "A" and "B," were described. In the report for this year the committee presented as information further discussion of the graphic methods, particularly with reference to Method "B," basing its further discussion upon the same typical classification yard of 50 tracks referred to in its previous report.

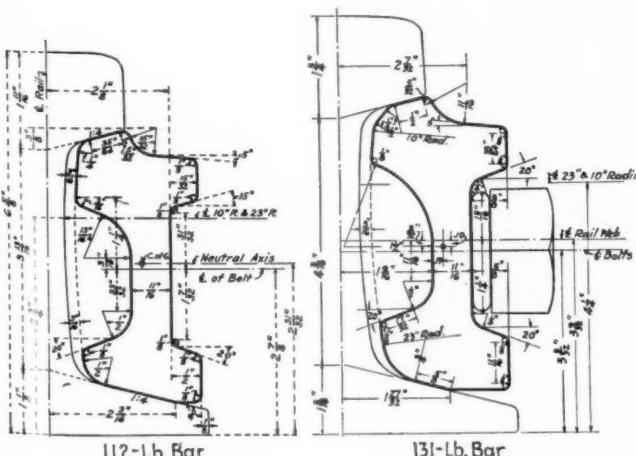
Revision of Manual—Under this section of its report, the committee recommended for adoption a considerable number of revisions in the present material in the Manual covering freight yards and rules for the location, maintenance, operation and testing of railway track scales. It also recommended that the section of the Manual entitled "Specifications for the Manufacture and Installation of Motor Truck, Built-In, Self-Contained and Portable Scales for Railway Service" be withdrawn.

All of the recommendations of the committee were approved without discussion, except the section relating to scales upon which separate action was requested.

Scales—The committee gave special attention to motor-truck, built-in, self-contained and portable scales for railway service, and presented new specifications for the manufacture and installation of these classes of scales. The new specifications, which were submitted as information, are intended eventually to supersede the specifications covering the same types of scales now in the Manual, which the Subcommittee on Revision of the Manual recommended be withdrawn. In fact, it was recommended that the new specifications be used in preference to the old, pending their final adoption, which it hoped may be at the 1935 convention.

H. M. Roeser (Howe Scale Company), in presenting this report, moved that the specifications for Motor Truck, Built-in, Self-Contained and Portable Scales for Railway Service, now in the Manual be withdrawn, and that the specifications presented in this report be accepted as the current specifications during the coming year and used in lieu of those to be withdrawn. This motion was carried.

Expediting Car Movements Through Yards—The report this year was restricted to a generalization of the subject of expediting freight car movements through yards, but the committee declared its intention of carrying its study into specific details if the subject is continued. It pointed out the more important factors affecting the movement of cars through yards; itemized improved methods of operation which should be studied; and listed numerous features and facilities which it pointed out might help to speed up the movement of cars through yards. At the



Sections of Proposed Joint Bars for Use with 112-lb. and 131-lb. R. E. Rail

*Gen. Scale Inspector, Pennsylvania.

end of its report, the committee tabulated earlier reports made to the association dealing with the subject of yards and yard facilities.

Bibliography—In this report the committee presented a bibliography of published articles, papers and books dealing with passenger stations and terminals; freight stations, terminals and yards; rail and water terminals; and airports.

Report on Ballast

A. P. Crosley, Chairman*

Four subjects relating to ballast were reported on by the committee, in connection with which it recommended several important revisions in the material in the Manual concerning the proper depth of ballast.

Specifications for Stone Ballast—The committee gave major consideration to a study of the cementing value of stone ballast and sent out a questionnaire on this subject, the replies to which it presented in tabular form. Only 6 of the 58 roads making reply advised that a cementing value test is used in the purchase of stone ballast, and the test requirements specified by these roads was shown to vary all the way from 1 to 450 lb. per sq. in. The committee pointed out the inconsistency of this and stated that to throw added light on this whole subject, it is taking steps to initiate a co-operative series of cementing value tests with the hope of obtaining reliable information of practical value for use in preparing specifications for ballast.

Proper Depth and Kind of Sub-Ballast—Following a historical review of all of the material that has been presented to and considered by the association on the proper depth of ballast, the report took up consideration of the new subject dealing with the proper depth and kind of sub-ballast. After pointing out the varying factors which must be taken into consideration in answering this question, and the difficulties encountered in making any specific recommendations for general adoption, the committee expressed its belief that the association cannot defend, except by opinion, a ballast section of any specific dimensions. As a result, it recommended that the six paragraphs now appearing in the Manual under the caption "Proper Depth of Ballast" be replaced by the following paragraphs:

(1) There is a relationship between several conditions, viz., rail section, ties, tie spacing, kind of ballast, speed, wheel loads, drainage, subsoil, kind of traffic, etc., and the depth of ballast. The depth of ballast should exceed the minimum required to distribute the superimposed loads to the subgrade uniformly without causing its deformation. Available data do not support a definite specification with reference to the required depth for general application under all conditions.

(2) In new construction, a combination of good sub-ballast and top-ballast does, with few exceptions, produce better results than a superior material used for the full depth. The ratio of the one to the other and the total depth in the aggregate should be determined with due consideration given to local conditions, as outlined in paragraph 1.

The committee also recommended certain changes in the captions which accompany the ballast sections contained in the Manual, to make them more inclusive and to indicate that the sections do admit of certain modifications.

Serious objections were raised to the committee's recommendations. Dr. A. N. Talbot (U. of I.) said that the proposed recommendations were not sufficiently specific in that they placed no definite limitations as to the conditions under which they applied. C. W. Baldridge (A. T. & S. F.) contended that the recommendations were no improvement over the matter now in the Manual. In response, A. D. Kennedy (A. T. & S. F.) who presented the report, contended that test data now available are not adequate for more specific recommendations, and a motion to refer the subject back to the committee for further study was carried. J. C. Irwin (B. & A.) suggested that the committee make specific recommendations as to any research it deemed necessary, and called attention to the inter-relation between this subject and the one assigned to the Special Committee on Design of Complete Roadway and Track Structure.

Costs of Maintaining Track on Various Kinds of Ballast—In a brief report, which outlined the character and extent of the information required to produce reliable data on this subject, the committee stated that it had had little success during the year in adding to the information already in hand. It offered the conclusion that no accurate comparison of costs can be obtained from such data as are being kept by the railroads, and that only by test sections watched by the committee for several years, could definite conclusive results be obtained.

Specifications for Prepared Gravel Ballast—The committee re-

ported that, owing to economic conditions, it had been hampered in furthering its studies and investigations during the last year, and, therefore, was not in a position to add to its previous reports. However, it reviewed its past efforts on this assignment and promised further constructive information and recommendations as soon as conditions permit a more vigorous prosecution of its work.

Other Subjects—Progress was reported in the consideration of the following subjects: Effects of different kinds of ballast on the life of ties, on the life of rail and upon rail failures, particularly as between gravel and crushed stone ballast; and the effect of better and deeper ballast on the cost of lining and surfacing track.

No revisions of the Manual were offered other than those recommended concerning the proper depth of ballast and the ballast section drawings.

Report on Track

C. J. Geyer, Chairman*

The committee reported in detail on a number of subjects, offering a considerable number of plans for adoption, and, in addition, reported progress in its consideration of four other subjects.

Revision of the Manual—The committee recommended the withdrawal or alteration of numerous plans in the Manual, together with a number of specific additions as substitutions, most of which were referred to in the specific reports of the various sub-committees.

It reported that it had reviewed in detail the plans heretofore approved and appearing in the Portfolio of Trackwork plans, with the result that practically all of them have been revised in some respect. The revised book of plans, it was said, will be available shortly from the secretary of the association. It recommended that all of the revisions made in the plans be approved.

As regards track tool plans, it was recommended that the present plans covering clay picks, tamping picks, spike mauls, lining bars, rail tongs, spike pullers, claw bars, track adzes, double-faced sledges, chisel-end tamping bars, spear-end tamping bars, track chisels, tie plug punches and round track punches, be withdrawn, and that revised plans of like numbering, which were submitted, be substituted.

The Committee recommended the withdrawal of the material in the Manual under the headings: "Table of Dimensions for Tie Plates" and "Data for Designing Tie Plates," a revision in the present material in the Manual under "Cut Track Spikes" to substitute definite lengths for spikes for the optional lengths now permissible; and revisions in and/or additions to the three following plans: Nos. 780 and 781, designs for solid manganese steel crossings of steam railroads over electric railways; and No. 980, having to do with alignment details for turnouts and tongue switch construction for use in paved streets. The committee also recommended the addition of a brief note to Plans 983, 984, 985 and 986, all of which have to do with track construction in paved streets. Extensive revisions were recommended in Plan 982, which also comes in this group. All of these revisions were approved.

Specifications for Soft Steel Track Spikes—The committee offered additional sections for inclusion in the specifications for soft steel cut track spikes, now appearing in the Manual. These had to do with tension tests and copper content. These specifications were approved for inclusion in the Manual.

In addition, it presented, as information, plans covering $\frac{1}{16}$ -in. and $\frac{1}{8}$ -in. raised throat cut track spikes, and a revision of the specifications now appearing in the Manual covering malleable iron tie plates, the latter having to do with tensile strength.

Track Tools—The committee submitted for adoption and printing in the Manual the following plans and specifications covering track tools:

General specifications for A. R. E. A. track tools, Plans A, B, C-1 and C-2; specifications for hickory handles for A. R. E. A. track tools, Plans D-1, D-2 and D-3; specifications for A. R. E. A. track shovels, Plan E; specifications for A. R. E. A. ballast forks, Plan F; Plan No. 21, September, 1933, A. R. E. A. track shovel; and Plan No. 22, September, 1933, A. R. E. A. ballast fork.

In addition, it submitted for adoption a design of frog and crossing limit gage for use in maintenance, and also for information two instruction and study plans.

The specifications and plans for track tools were adopted for publication in the Manual, as was also the design for the frog and crossing limit gage.

Switches, Frogs, Crossings, Slip Switches, Etc.—In conference

* Division Engineer, Reading.

*Assistant to Vice-President, Chesapeake & Ohio.

with the Standardization Committee of the Manganese Track Society, the committee prepared and presented Plan 505, specifications for adjustable guard rail clamps, which it recommended be adopted as recommended practice. This plan was approved for inclusion in the portfolio of trackwork plans.

Effect of Roller Bearings on Gage and Elevation on Curves—Following a summary of the replies to a letter of inquiry addressed to the larger bearing manufacturers concerning possible limits in the use of roller bearings on railway equipment for operation over curves at any desired speed, the committee offered the following conclusion:

There is no different problem in the selection of the proper elevation for curves over which it is desired to operate railway equipment using roller bearings, than is present if the equipment is fitted with ordinary bearings.

Design of Tie Plates for RE Rail Sections—As a result of its study of a large number of the standard drawings for tie plates used by the larger roads of the country, the committee prepared and presented seven tie plate plans, and an additional plan which summarized the principal characteristics of the designs shown in the other plans. The new plans, which, with two notes, were submitted for adoption in substitution for certain material already in the Manual, covered several sizes of plates, with inclined or flat ends and with one or two shoulders.

Dr. A. N. Talbot (U. of Ill.) discussed the purpose of tie plates, which he said, is to distribute the load on the rail so that the pressure on the ties will come within a reasonable limit, and the relation of these pressures to tie-plate design. He showed that this distribution requires a certain amount of eccentricity in the plate to prevent too great pressure on the wood fibres at the ends of the plates, as well as to eliminate the tendency toward widening or tightening the gage. He showed that canting the plates introduces stresses that require these plates to be thicker than those that are perfectly flat. He also stated that from his studies in connection with stresses in track it was found that the length of the plate has no appreciable effect on the stresses that are set up in the base of the rail, but added that the thickness should always be sufficient to resist the tendency of the plate to bend.

Through these studies it had been shown that moon-shaped breaks result largely from track conditions that throw all or nearly all of the load on the rail base near its edge, rather than from the design of the tie plates.

Dr. Talbot also stated that ties should be pre-adzed to insure that the bearing of both rails on the tie will be in the same plane, and that anchor-bottom tie plates are undesirable unless the bearing surfaces are grooved to take the anchor projections. Since the bearing of the rail base on the tie plate cannot be perfect and a convex surface permits rocking, he advocated the insertion of pressed-wood shims between the rail and plate to overcome this unevenness and decrease the stresses in the flanges of the rail base.

L. W. Skov (C. B. & Q.) described a large number of tests on that road in which it was found that where white-oak ties were used, compression stresses of 600 lb. were found in the wood fibre at the center of the plate and 300 lb. at the edges, but that with softwood ties these stresses were reversed. Stresses up to 38,000 and 40,000 lb. were also found in the base of the rail. Investigation also showed that anchor-bottom tie plates did not become fully seated on white oak ties earlier than two years after installation. W. J. Burton (M. P.) recommended that further study be given to these designs before adoption.

A motion to adopt as standard these designs for tie plates was lost and the plans were returned to the committee for further study.

Tie Plates in Their Relation to Other Parts of Track Structure—On account of the preparation of new designs for tie plates, undertaken by the committee, and the preparation of a design for a new joint bar, undertaken by the Rail committee, the committee recommended that this subject be discontinued.

Reflex Units for Switch Lamp and Targets—The committee advised that few additional installations of reflex units had been made during the year and that a number of the roads that had reported the use of these units last year have been forced to remove many of them for various reasons. It reported further that none of the roads questioned has considered the use of reflex units for outlining switch stand targets.

Desirable Tightness of Track Joints—After analyzing replies to a questionnaire sent out, the committee drew up a set of conclusions which it presented as its report for the year. Abstracts from these follow:

The desirable tightness of track joints can be obtained by the average trackman exerting his full strength on a 42- to 48-in. wrench, depending upon the size of the bolt, kind of threads and condition of the bolt, and by frequent inspection and careful maintenance.

With over-tight joints there is a tendency for the rails to kink and for batter to be excessive at the wider joint openings. This, however, will have little effect generally upon the life

of the rail as a whole. The life of the joints will be increased because the tightness will tend to reduce to a minimum the movement of the rails and joint assembly, thereby reducing wear.

Loose joints cause excessive batter of rail ends, surface bent rails, abnormal wear on both rails and joints, and are responsible for a very large portion of the labor cost of maintenance.

Reconditioning of Rail Ends, Fastenings, Frogs and Switches in Track—Along with a brief statement with regard to the reconditioning work done by various roads using both the electric-arc and oxy-acetylene processes, the committee presented in tabular form the replies received to a questionnaire dealing with the important phases of reconditioning rails and special trackwork in track.

The replies indicated considerable variation in the cost of building up rail ends on different roads, and the committee stated that so many variables enter into the work that cost figures from one road cannot be compared with those of another unless complete details of the work are available. They also indicated that the building up of rail ends is economical, and that it increases the life of main track rail in its first position from 50 to 100 per cent. It was agreed that first class results can be secured by both methods in common use. Failures reported were negligible.

Damage From Brine Drippings—Working with the Mechanical division, A. R. A., the committee drew up a set of conclusions with regard to the damage to track and bridges as a result of brine drippings from refrigerator cars. In these, which were submitted as the committee's report, the committee recommended a higher degree of maintenance of tanks and fittings on existing brine tank equipment, and better protection of tracks, bridges and signals against brine drippings. It said that under existing circumstances, this seems the most economical and practical procedure. It was recommended that the subject be discontinued.

Track Construction in Paved Streets—The committee offered revisions in Plans 780 and 781, having to do with solid manganese steel crossings of a steam railroad over an electric railway, and in Plan 980, having to do with alignment details for turnouts and tongue switch construction for use in paved streets. New plans, dated March, 1934, bearing the same numbers and incorporating the revisions, were recommended for adoption by the Sub-committee on Revision of Manual.

Selective Welding at Rail Joints—The committee reported that in view of the work of another sub-committee dealing with the methods of reconditioning rail ends, fastenings, frogs and switches in track, its own investigation was limited to determining when selective or out-of-face welding should be done. It pointed out that this phase of the subject was completely reported on last year, and recommended that for this reason the subject be discontinued for the present time.

Other Subjects—Progress was reported on the following subjects: String lining of curves; the reclamation of serviceable materials from scrap and retired maintenance of way and structures machines, tools and appliances; corrosion of rail and fastenings in tunnels; and the determination of the limiting relative positions of the abutting rails of fixed and drawspans on bridges.

Report on Stresses in Track

Dr. A. N. Talbot, Chairman*

The Sixth Progress Report of the Special Committee on Stresses in Track, comprising a Bulletin of 308 pages, consisted in large part of a continuation of the report of the investigation of rail joints, the earlier discussion of this subject having been covered in the Fifth Progress Report. However, about one-third of the report was devoted to a discussion of the general properties and quality of track with particular inference to the stiffness of the rail support, as measured by its modulus of elasticity, u .

The subject of rail joints is treated in chapters covering Laboratory Tests, Tests on the Pennsylvania, Tests on the Chesapeake & Ohio, and Discussion of Tests of Rail Joints, and may be summarized as giving an analytical discussion of the behavior of joints, bars under load and an interpretation of the test data with respect to the influence of the mathematical properties of the joint bars, the effect of fit, wear, tension in the bolts, number of bolts, length of the bars, etc. While the report offers some general principles, the reader is left largely to his own devices in arriving at conclusions with respect to specific details.

The discussion of the general properties of track, while based in large part on data recorded in earlier reports, is supported in

* Professor Emeritus, University of Illinois, Urbana, Ill.

this report by records of track depression and rail stress tests made on the Chesapeake & Ohio, and tests of GEO track on the Missouri-Pacific. Following a review of the action of track as an elastic structure, which shows how the deformation of the track under load is a function of the stiffness of the rail and of the rail support, this theory is demonstrated by charts and tables showing the variations in the depression of the rail under wheel loads with combination of rails of different weight with various degrees of substructure stiffness, i. e., values of u . One article, also, outlines the procedure for determining the value of u by means of field tests on a given section of track.

The report is concluded with a discussion of variability in the stiffness of track, citing specific examples of lack of uniformity from tie to tie, and showing how variability influences the magnitude of the stresses developed in the rail.

In presenting this report, Dr. Talbot gave a general review of the work of his committee, touching on a few fundamentals. His talk, which was illustrated with lantern slides, will be abstracted in a later issue.

Report on Maintenance of Way Work Equipment

C. R. Knowles, Chairman*

Carrying forward its work for another year, the committee presented reports on eight subjects, and reported progress on nine other subjects.

Air and Electric Tools in Maintenance Work—Under this assignment, the committee studied various types of track grinders designed and used for finishing welds on rails, frogs and crossings, as well as for grinding off overflowed metal at switch points and stock rails, and, in some cases, on the low side of curves. It pointed out that such grinders may be divided into two general classes—those equipped with revolving wheels, and those known as reciprocating grinders—and briefly described the different types in each class and their characteristics.

Under the head of the relative merits of track grinders, the committee discussed the proper speed of grinding wheels; power units; types of drives; lubrication; air cleaners; feed of the grinding wheel to the work; and the correct pressure that should be applied to the wheel to maintain a rapid rate of cutting.

Snow Melters—Owing to the exhaustive treatment of this subject in last year's report, the committee found little to add this year. Such additions as were made included reference to the use of calcium carbide, two designs of oil-burning pots, and two types of electric heaters. Following a short bibliography of material published recently pertaining to snow melters, the committee again pointed out that under proper conditions, snow melting devices are an aid in facilitating train operation and in reducing maintenance expenses.

Tractors in Maintenance Work—Supplementing its thorough report on this subject last year, the committee presented data on several specific operations of track-type tractors and certain specially designed attachments for use with these tractors. The attachment given major consideration was the front-end loader. This device was fully described, as was also its adaptability for the handling of materials, especially snow in and about terminals.

The report also called attention to the practicability and wide range of usefulness of air compressors mounted on track-type tractors, and pointed out the advantage of this combination in mobility and in reducing the length of hose or pipe required.

As Part II of its report, the committee presented what it termed a "Scoring Sheet" for tractors, which calls for the rating of all of the features which should be taken into consideration in the selection of this type of unit. The scoring sheet, in the words of the committee, is designed to provide a method by which the qualities and merits of tractors may be compared more intelligently and systematically.

Weed Destroying Equipment—After pointing out the objections to the unrestricted growth of vegetation on the right-of-way and in the roadbed, the committee discussed briefly under separate headings the different methods of eradicating or controlling weed growth, including hand methods, chemical weed killers, non-poisonous powder (Atlacide), steam weed destroyers, ballast dickers, and weed burners.

Following are abstracts from the report: The average cost of a single removal of weeds from roadbed by hand varies widely and in some localities may be as high as \$125 per mile.

Experience with the use of chemical weed killer over a period of approximately 14 years indicates that the treatment has a sterilizing effect on the ballast, although the effect is cumulative only to a certain point. Non-poisonous powder (Atlacide) has given very satisfactory results. It is applied by hand and is

particularly valuable to the signal department for sprinkling around signal poles and other signal apparatus.

Steam weed destroyers produce good results, serving the purpose of cleaning by hand and at much lower cost. The steam treatment, however, does not kill the roots. Track mowing machines, self-propelled and non-self-propelled, are used extensively with satisfactory results. Ballast dickers give best results when the track is fully ballasted with small gravel, burnt gumbo or chats, to at least eight inches under ties. They are not very effective on track ballasted with crushed stone of 2 or $2\frac{1}{2}$ -in. size or larger, of a quality which packs closely or cements in the track.

The development of weed burning machines was carried forward in large measure from the experience of the Yazoo & Mississippi Valley railroad. While these machines were efficient labor-saving devices and more economical than any other method of destroying weeds during their early development, weed burning machines with many improvements developed in the last six or seven years have resulted in still greater efficiency of operation. The two makes used now most extensively are the Fairmont and the Woolery.

As a part of its report the committee presented data from a number of roads concerning weed killing methods employed and the costs involved.

Track Welding—The committee discussed both oxy-acetylene and electric arc welding, dealing with the conditions involved in the selection of proper equipment and with the various types of equipment available. Abstracts from the report follow:

The oxy-acetylene torch is generally considered preferable for cutting purposes, whereas the electric arc is the only method that has been employed successfully in welding manganese. The relative economies of the two methods of welding are subject to considerable deviation and depend largely upon the organization and methods of operation. The following facts, however, are generally applicable in studying the difference in cost of work performed by the two methods:

(1) Oxy-acetylene welding requires less equipment and a lower initial investment than electric welding.

(2) Due to the limitations of capacity of electric welding equipment in general use, the number of welders that can be used conveniently at one location is larger with oxy-acetylene welding than with electric welding.

(3) The welding equipment necessary for oxy-acetylene welding is much more portable than equipment for electric welding.

(4) Oxygen and gas required for oxy-acetylene welding are more expensive than the gasoline and oil necessary to drive portable electric welding machinery, or for electrical energy for driving motor-generator electric welding machinery.

(5) To obtain the maximum economy from electric welding equipment, it must be portable and kept in service as nearly continuously as practicable.

The committee commented at some length on the extent of oxy-acetylene welding being done by the track department, and upon the improved equipment that has been developed, including torches and gas regulators, and a torch with a double flame tip.

Following a general discussion of the two general types of electric arc welding equipment—namely, the alternating current type and the direct current type—the committee gave special attention to the various types of mountings available for this equipment. It referred to the recent development of mounting the welding generator on a tractor, and cited the tank-type tractor mounting used on the Lehigh Valley and the track-type tractor mounting employed on the Delaware, Lackawanna & Western.

In concluding its report, the committee discussed the characteristics desirable in arc welding equipment, types of connections, and the voltage drop in various sizes and lengths of cable with various currents flowing through them.

Ballast Cleaning Machines—The committee described in considerable detail a recently developed, two-sided, large-capacity ballast cleaning machine and a ballast drainage car with scarifiers and blades, adapted to working in stone ballast shoulders. The ballast cleaning unit described operates in a border and intertrack space, or in two intertrack spaces simultaneously, if desired.

During the last summer this machine, while working on a four-track section of a busy Eastern road, cleaned in three weeks, working two eight-hour shifts a day, 328,728 ft. of intertrack space and 142,797 ft. of border. Including the dirt handling equipment installed on the purchaser's flat cars, the machine cost \$125,000. Operated on a contract basis in 1933, the overall cost per foot to the railroad company, including supervision, train crew wages, locomotive rental and expenses, insurance coverage for casualty, property and liability, complete disposal of all dirt, and all charges for ballast cleaning, was 4.17 cents for center ditch and 2.12 cents for border.

As a result of its study of ballast plows and dickers, the committee found the attachment type not very effective, but it said that heavy outfits are available to be operated at slow speed by powerful special motor cars, which do excellent work in gravel

*Superintendent Water Service, Illinois Central System.

ballast. It reported that a car is now being developed having a plow in conjunction with a discer, which will undercut the ties at the ends and throw the ballast out to permit drainage. After a period of two or three weeks has elapsed, the machine makes another trip over the track, at which time it throws the ballast back against the ends of the ties and reshapes the border.

With regard to a ballast drainage car developed recently, the committee said in part as follows:

Using its scarifiers, the machine makes three to five trips, each time plowing a deeper layer of ballast. The scarifier points loosen the pieces of rock from surrounding dirt, rolling and shoving the mixture outward against a stop plate. This leaves ballast piled near the toe line for drying out a few days if muddy. When dry, the rock is bladed back in two trips to approximate shoulder section. The first blading places the upper and cleaner ballast against the ends of the ties. The second cut slopes the outer and lower shoulder, which is further cleaned by rains.

Paint Spraying Equipment—The report dealt with the results of a test of the application of bridge paint by means of the spray gun and a hand brush, conducted primarily to determine the comparative qualities of certain bridge paints. However, the committee pointed out that much of the data collected were of value in comparing the two methods of application, and presented a number of facts to this end.

It was concluded that the results of the test demonstrated fairly conclusively the economy of spray painting as compared to the hand brush method, when applied to large surfaces.

Hazard of Spray Painting—In a short yet comprehensive report, the committee discussed the hazard to health in the handling of paints and painting materials, and pointed out that there is some hazard, regardless of whether application is by brush or spray. It suggested a number of measures for overcoming dangerous practices in the use of paints.

Standardization of Motor Car Parts—The committee reported that it has had under consideration a number of motor car items on which recommendations have not been made, including loose wheels, lubrication of axle bearings and types of shut-off cocks. It pointed out the various reasons for this delay, and expressed the hope that report and recommendations covering these items can be made next year. It reported progress on details of ignition systems not covered previously, as well as a number of other accessories, including axle bearing thrust collars, belt pulleys, battery boxes and coils.

Other Subjects—The committee reported progress on the following subjects: Revision of the Manual; methods of keeping data on work equipment and labor-saving devices; the selection and training of maintainers and operators of work equipment; the use of ballast discers; organization for the use of tie-tamping machines, air and electric; rail laying machines and auxiliary equipment; tie adzing, scoring and boring machines; manual of instructions for the care and operation of maintenance of way work equipment; and the use of oil spraying machines for oiling rails and fastenings, steel structures and roadbed.

The entire report was accepted without discussion.

Report on Wood Preservation

F. C. Shepard, Chairman*

The committee reported on eight subjects, carrying forward the records of tests being conducted, and made several important revisions in and additions to the Manual.

Specifications for Treatment of Air-Seasoned Douglas Fir—Last year, the committee presented, as information, specifications for the treatment of air-seasoned Douglas fir, with the recommendation that they be referred to other interested committees for criticism and approval. During the year the specifications were reviewed and approved by the committees on Ties, and on Wooden Bridges and Trestles, and, as a result, the committee presented the specifications for adoption and inclusion in the Manual. The specifications cover the selection and handling of Douglas fir prior to treatment; fundamentals concerning treatment in general; creosote treatment; zinc chloride treatment; creosote-zinc chloride treatment; and treating operations as they concern piles and poles. These specifications were adopted without comment for inclusion in the Manual.

Revision of the Manual—In order to bring the specifications of the association for creosote oil into harmony with the specifications for this same material adopted by the American Wood Preserver's Association and the American Society of Testing Materials, and thereby eliminate certain confusion which exists, the committee, after several years of collaboration with representatives of these bodies, recommended revisions in the Manual to this end. After out-lining the changes neces-

sary and the reasons therefore, the committee recommended that the present specifications in the Manual covering Creosote, Grades One, Two and Three be withdrawn, and that revised specifications covering Creosote, Grade One, and specifications covering Creosote coal-tar solutions, both of which is submitted in full, be adopted for publication in the Manual. The committee also presented for adoption standard methods for the determination of tar acids in Creosote, not considered heretofore by the association, pointing out that the methods recommended are the same as those in the Manual of the American Wood Preserver's Association, and have been practiced for many years. All of these recommendations were approved without discussion.

Service Test Records of Structural Timber—In response to a circular letter, the committee amassed a large amount of data concerning the service life of timber structures on 16 different roads, and it then based its report largely on an analysis of these data. Following a digest of the outstanding facts brought to light in the information collected, the report contained detailed reference to the extent to which treated timber is used in ballasted deck trestles on the Santa Fe, its service life and causes of renewal, furnished by the chief engineer of that road. The report also included detailed reference to the construction and present condition of the Lake Pontchartrain trestle of the Southern, and, in tabular form, a summary of the information furnished by various roads concerning service records of treated and untreated timber structures.

As a result of its study, the committee offered several general conclusions concerning the life of treated structures and the causes for their premature failure in some cases, which it recommended for adoption and inclusion in the Manual. These conclusions were adopted without comment.

Service Test Records for Treated Ties—As in previous years, the report included the usual table of tie renewals maintained on various roads, brought up to include renewals for 1932, and also data with regard to a number of special test sections being observed carefully on several roads.

Piling Used for Marine Construction—Following its practice of past years, the committee reported on the present condition of the long-time test pieces prepared and observed by itself, the Chemical Warfare Service, the Sea Action committee of the Institution of Civil Engineers—England, and other operators. No outstanding conclusions were reported as a result of any of the tests, many of them having been under observation an insufficient length of time as yet to expect conclusive facts.

Destruction by Termites and Means of Prevention—After stating that reports coming to it during the year indicate that termites have been very active in many parts of the United States, and then citing several specific localities of attack, the committee presented information concerning the investigations carried out by R. C. A. Communications, Inc., in co-operation with the United States Bureau of Entomology, to test the effect of various soil poisons. As another part of its report, the committee, with the permission of the American Wood Preserver's Association, reprinted a part of the fourth progress report on another series of tests undertaken by the Bureau of Entomology, the report itself having been printed originally in the 1933 Proceedings of the A. W. P. A.

As regards the test installed at Florissant, Mo., which the committee called attention to last year, it reported that little further attack by termites had occurred and that the test will be continued.

The committee also reported further on wharf borers, first mentioned in last year's report, and presented two reports prepared by Ralph H. Mann concerning the activity of wharf borers in structures of the General Aniline Corporation at Linden, N. J., and in some piles of the New York Dock Company, Brooklyn, N. Y. The committee stated that from these two reports it would appear that the insect is still active. However, it also stated that as yet it is not known whether the borer will attack only wood that is starting to decay or has decayed, or whether it will also go into sound untreated and creosoted wood. In presenting this part of the report, Dr. Hermann von Schrenk (consulting timber engineer) chairman of the sub-committee, requested the members to be on the alert for the presence of the wharf borer as this insect has been active in certain localities.

Loss of Preservative in Treated Ties in Track Due to Weed Burners—Following a brief reference to its past investigations with regard to the loss of preservative in ties due to the repeated use of oil-burning weed destroyers, the committee presented further results of the tests which it has conducted, and also information concerning similar tests carried out on the Chicago, Rock Island & Pacific. In concluding its report, the committee said as follows:

All experiments thus far along this line seem to indicate that little actual loss of preservatives may be expected from the normal operation of weed burning machines, while, on the other

* Consulting Engineer, Boston & Maine.

hand, considerable damage to treated ties will follow the careless operation of such machines. It is, therefore, strongly urged that every care be exercised to prevent the abuse to ties in track because of the careless operation of these machines, and that this work be most closely supervised by all concerned.

In discussing this portion of the report, R. C. Bardwell (C. & O.) said it was his understanding that the committee was also to have reported on the loss of preservative in treated ties in track due to locomotive blow-down. Mr. Shepherd replied that the committee had decided to make a further report on this subject for next year.

Methods of Protecting Treated Materials in the Field—As a result of its effort and collaboration with the committees on Ties, and on Wooden Bridges and Trestles, the committee presented a large number of rules for the guidance of employees in the proper handling, installation and protection of treated materials. Eighteen separate rules were included under the subject of ties; 12 under the head of bridge timbers; 8 under piling; 3 under switch ties; 2 under signal timber and trunking; and 5 under telegraph poles. Many of the rules pertaining to cross-ties were indicated as applicable also to switch ties.

It was suggested that collaboration be effected with the Committee on Rules and Organization to the end that approved rules may be prepared for adoption and inclusion in the Manual.

Report on the Water-proofing of Railway Structures

J. A. Lahmer, Chairman*

The committee submitted for adoption and inclusion in the Manual, specifications for membrane waterproofing, and discussed at some length the waterproofing and dampproofing of various types of structures.

Specifications for Membrane Waterproofing—Last year the Committee submitted as information specifications for membrane waterproofing. With some minor changes, these specifications were submitted this year for adoption. The specifications, which include 72 articles, apply to all concrete railway structures, except roofs. It was recommended that the new specifications replace those now in the Manual entitled, "Specifications for the waterproofing and drainage of solid-floor railway bridges." These specifications were adopted without comment.

When to Waterproof or Dampproof, and Methods To Be Used—Following a series of nine pertinent notes on waterproofing, and seven such notes on dampproofing, the committee discussed the subject from the standpoint of specific types of structures, including the following: Abutments, piers and retaining walls; single-span arches and box culverts; pedestrian subways; multiple-span arches with spandrel fill; precast slabs for bridge decks and floors; cast-in-place concrete bridge decks or floors; pump pits for subways and basements; pipe manholes and pipe tunnels; water containers; walls and floors of buildings; and grain elevator pits and similar underground structures.

Other Subjects—The committee made no report on its assignment covering waterproofing and dampproofing as applied to existing railway structures, and recommended no revisions in the Manual.

Wooden Bridges and Trestles

H. Austill, Chairman†

The committee gave consideration to nine subjects dealing with timber structures and related subjects, reporting in detail on some of them, and progress only in connection with others.

Overhead Highway Bridges—The committee called attention to dimensions for piles called for in the specifications for timber piles in the Manual, and said that these were larger than required in overhead highway bridges. To correct this situation, it presented as information a new set of limiting dimensions for first class piles of different woods for use in highway bridges.

The committee stated that it had given consideration to the new type of composite beam described by J. F. Seiler, engineer, Service Bureau, American Wood Preservers' Association, and that it may include this type of construction in the standard plans which it is preparing for overhead highway bridge construction.

Wooden Trestles for Heavy Loading—The committee called attention to the fact that present plans in the Manual provide

* Senior Assistant Engineer, Missouri Pacific.
† Bridge Engineer, Mobile & Ohio.

only for Cooper's E-45 and E-60 loadings, and then proceeded to show that many modern locomotives result in loadings considerably in excess of these design loads. After analyzing the loadings of some of the more modern power, it presented in tabular form a comparison of unit stresses for a selected number and size of stringers for open and ballasted deck trestles subject to Cooper's E-70 loading. It called attention to the two methods employed in computing longitudinal shear, one of which was based on an extensive series of tests made by the Forest Products Laboratory, and presented as Exhibit A, a statement concerning the results of these tests, prepared by J. A. Newlin, a member of the committee.

Relationship Between Energy of Hammer and Mass of Pile—The committee found little data available from actual records which would assist in its study, and, therefore, recommended that actual tests be conducted covering both wood and concrete piles, and three weights of hammers.

Strengthening of Existing Bridges—Viewing this subject from the standpoint of wooden trestles and of methods of changing structures to a heavier type rather than the making of ordinary repairs, the committee offered as information a number of definite suggestions covering a wide range of construction details.

Washers, Separators, Cap-Stringer Straps and Other Fastenings—Study of trestle and trestle fastening plans collected by the committee from various roads showed a number of different methods and details of fastenings. The committee pointed out that there was little reason for this variance and voiced its intention to prepare standard designs for washers, separators and fastenings. In fact, it stated the principal points that it will keep in mind in this work and presented preliminary designs for several fastening details.

Revision of the Manual—As a result of consideration of material in the Manual having to do with wooden bridges and trestles, the committee recommended a number of relatively minor revisions and omissions, all of which were accepted with some changes.

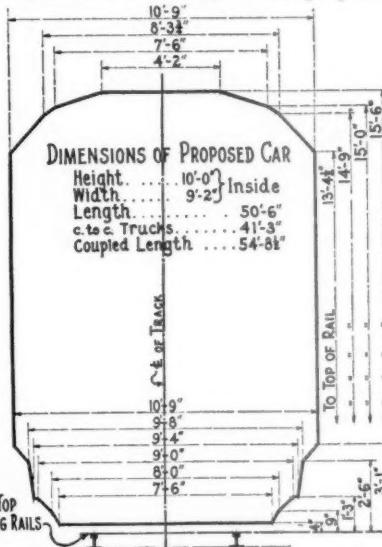
Simplification of Grading Rules—Owing to business conditions and their effect on the activity of lumber associations, the committee was not able to carry forward its work during the year. However, it stated its intention to continue its efforts. It reported that it had completed collaboration with the Mechanical division A.R.A. on the subject of lumber for freight cars and locomotives.

Other Subjects—The committee reported substantial progress in its consideration of the improved design of timber structures to give longer life with lower cost of maintenance, but said that it had not been able to advance its studies with regard to the best method of determining the bearing power of piles.

Report on Clearances

A. R. Wilson, Chairman*

As its report for this year, the committee submitted for adoption, without comment, an outline of the proposed A. R. A.



Limiting Equipment Diagram for Interchange Service

standard box car. This diagram is one of the series that the committee is working on and supplements five diagrams which have already been approved by the association and which ap-

* Engineer of Bridges and Buildings, Pennsylvania.

pear in revisions and additions to the Manual, as published in Bulletins 337 and 349.

In submitting the report, Chairman Wilson stated that the committee wished to delete all reference to the A. R. A. standard car, and designate the diagram as a Limiting Equipment Diagram for Interchange Service. His motion to adopt the diagram was carried.

Economics of Railway Operation

J. E. Teal, Chairman*

Six subjects were reported on in detail by the committee, which also reported progress on four other assignments.

Methods or Formulae for the Solution of Special Problems Relating to Operation—The adoption of the new standard 131-lb. RE rail section by the association in 1933 raised a number of questions as regards the economies in the cost of operation, if any, that could be gained by replacing 130-lb. RE rail with the 131-lb. rail. Following in large measure the procedure adopted by A. N. Reece, chief engineer, Kansas City Southern, the committee made a detailed economic comparison of the two rail sections to determine the extent of the economies in the use of the new section. The main subjects considered were: life of rail, effect of wear on life of rail, effect of carbon content upon the life of rail, effect of amount of rolling and rapidity of cooling upon the life of rail, effect of stiffness of rail upon its life, effect of width of head upon the life of rail, estimated life of the two rail sections, material cost of the two rail sections, effect of rail upon track maintenance, effect of rail on maintenance of equipment, economies in cost of tie renewals per mile of main track, effect of rail upon train operation, and re-capitalization.

Following the detailed discussion, the committee offered the following conclusions:

The 131-lb. RE section is an improvement over the 130-lb. RE section for reasons as follows:

The increased girder strength of the 131-lb. RE section should produce better riding track, with less damage to equipment and track, and a lower operating cost. The improvement in the design of the rail head should result in a better quality of metal, thus prolonging rail life and decreasing the possibility of accidents due to breakage. These factors should result in an appreciable saving without materially increasing the investment.

Most Economical Train Length—The report on this subject was presented in two parts. The first consisted of a supplement to, and in part a continuation of, the committee's report in 1933, which consisted of a study of the characteristics and performances of typical steam locomotives for the purpose of developing a simple method for determining the weight of train and the speed which will give the maximum gross ton miles per hour for various classes of locomotives and trains on various grades. In the present discussion, new examples were presented to show how the data included in the report can be applied in the preliminary determination of locomotive capacities and other factors depending upon them.

The second part of the report was a preliminary comparison and discussion of freight trains and yard switching performance for the purpose of noting the effect of the operation of heavy trains on yard performance.

Effect of Volume of Traffic on Operating Expenses—The committee pointed out that in the past the division of operating expenses into two parts, one designated as fixed, and the other as variable, has been left largely to judgment of the various items of expense as developed in the primary expense classification of the Interstate Commerce Commission. It cited the "Yager formula" of the association as an example of this form of treatment, having particular reference to maintenance of way and structures expenses. Then, after showing how this method of determining fixed and variable expenses is open to criticism, it presented in detail, with much of the underlying theory involved, a statistical analysis of the problem of determining fixed and variable operating expenses on the basis of rectilinear correlation by the method of least squares.

Revision of the Manual—The committee did not agree with suggestions which have been made that certain percentages included in the Manual, having to do specifically with the per cent of maintenance of way expenses affected directly by use of facilities, should be changed because of changes which have been made in maintenance of way practices. It pointed out that these percentages are not intended to be final, but rather are specifically noted as possible of variation to suit special circumstances. On the other hand, the committee recognized that the method outlined for determining allowances for varied use has been used in a manner contrary to the original intention, in view

of which it prepared a cautionary paragraph, which it recommended for adoption and inclusion in the appropriate place in the Manual.

Other Subjects: Progress was reported on the following subjects:

Methods for obtaining a more intensive use of existing railway facilities, with particular reference to securing increased carrying capacity—(a) without material additional capital expenditures, and (b) with due regard to reasonable increases in capital expenditures consistent with traffic requirements; the most economical makeup of track to carry various traffic densities; the discontinuance of non-paying trains and agencies; and operation with a reduced number of main tracks.

This report was received without comment.

Report on Masonry

Meyer Hirschthal, Chairman*

The committee reported on six subjects, with which it submitted for adoption a series of drawings covering a design for a reinforced concrete trestle for E-60 loading. Progress was reported on three other subjects.

Concrete—Specifications and Principles of Design—The committee submitted as Section I of its report, a number of detailed drawings covering a design for a reinforced concrete trestle, for E-60 loading. It recommended that these be approved for publication in the Manual.

B. R. Leffler (N. Y. C.) called attention to the lack of any lateral bracing in the plans for the reinforced concrete trestle. A. N. Laird (G. T. W.), chairman of the subcommittee, replied that the design indicated was applicable only to bridges of normal heights and that for greater heights additional bracing could be added. Mr. Leffler then objected to the amount that the two sides of the reinforced concrete caps overhang the piles and Mr. Laird replied that the caps were designed to meet this condition and that, in addition, the tops of the caps were chamfered to centralize the bearing of the floor slab as much as possible.

J. E. Willoughby (A. C. L.), in commenting on the use of 16-in. concrete piles in the trestle, as called for in the design, stated that it had been his experience that for purposes of design a diameter of 16 in. was sufficient but that a diameter of 18 in. was required to give sufficient protection for the reinforcing.

Mr. Leffler said he thought it was a mistake to design this trestle on the basis of E-60 loading as in some localities loadings amounting almost to E-70 were prevalent. Mr. Laird then explained that there are many locations where the E-60 loading is applicable and added that the committee plans to develop designs of trestles for E-70 or E-72 loading for presentation at a later date. The design as proposed by the committee was then adopted.

As Section II of its report, it added to its previous works on the design and construction of reinforced concrete arches, submitting as information sections covering both design and construction.

Progress in Concrete Manufacture—The committee divided its report into three sections, the first dealing with vibration in the placement of concrete, the second dealing with central-mixed and transit-mixed concrete, and the third with segregation. Each of these subjects was treated in detail, and, in addition, under Section I, the committee presented a selected bibliography of articles and publications on the high-frequency vibration of concrete.

Specifications for Foundations—The committee prepared new general specifications for foundations for railway structures, which it submitted as information, except definitions of the terms "foundation" and "substructure," which it recommended for adoption and inclusion in the Manual. These were adopted.

Lining Railway Tunnels with Concrete—Under this assignment the committee presented tentative specifications for the lining of new railway tunnels and the relining of old tunnels with concrete, the specifications being prepared under six sections, as follows: General, design, concrete, forms, placing concrete, and construction and expansion joints. The specifications are intended to apply only in the case of tunnels through ordinary formations which involve no special problems.

Pneumatically Projected Concrete—The committee presented tentative specifications for "Shotcrete," which it defined as a material consisting of Portland cement, sand and water placed pneumatically by means of a machine that discharges water and pre-mixed cement and sand, under regulated pressures, through pipes or hose, and a discharge nozzle, the water being combined with the cement and sand at the nozzle. The specifica-

* Special Engineer, Operation, Chesapeake & Ohio.

* Concrete Engineer, Delaware, Lackawanna & Western.

tions were prepared under the two heads, general, and additional requirements for shotcrete protection of structural steel.

Expansion Joints Involved in Masonry Structures—The committee gave further consideration during the year to the plans it had collected from a number of roads covering various types of joints involved in masonry structures, and, as a result, it offered a series of basic principles which it said should be observed in determining the details of expansion joints. It also submitted a series of 21 sketches of joint construction, with brief comments with regard to each.

Other Subjects—The committee reported progress on three of its assignments as follows: Revision of the Manual, contact with Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, and specifications for overhead highway bridges as prepared by the Association of State Highway officials.

Report on Electricity

W. M. Vandersluis, Chairman*

In fulfilling its assignment to keep the association informed of developments in the application of electricity to railway service, and of the current activities of the Electrical section, A.R.A., the committee made reference to the series of reports made by committees of the Electrical section, and presented a brief summary of each report. The subjects covered in the reports were as follows:

Developments in the application of electricity to railway service, inductive co-ordination, power supply, electrolysis, co-operation in miscellaneous regulations, overhead transmission line and catenary construction, standardization of apparatus and materials, electric heating, application of motors, clearances for third-rail and overhead working conductors, protection of railroad equipment from danger of fire caused by electric sparks during the transfer of inflammable liquids, specifications for track and third-rail bonds, illumination, design of indoor and outdoor substations, high tension cables, application of corrosion-resisting materials to railroad electrical construction, form of power contract for large blocks of power, and radio antennae on cars in electrified territory.

The committee called attention to the fact that the complete reports are printed in Bulletin 359, dated September, 1933, and that since there was no meeting of the Electrical Section in 1933, no action has been taken on the reports.

The report was received without discussion.

Report on Standardization

J. C. Irwin, Chairman†

As in the past, the committee reported its efforts during the year to encourage the use of A.R.E.A. recommended practices, and its activities and contacts with other bodies interested in the advancement of national standardization.

In regard to its work of promulgating the use of A.R.E.A. standards, it reported on its contact with R. L. Lockwood, director of the section of purchases on the staff of the Federal Co-ordinator of Transportation, and, more specifically, of two meetings held in Chicago and attended by Mr. Lockwood, the president and Board of Direction of the association, and representatives of the other divisions of the A.R.A. It called attention to the high regard of the Director of Purchases for the work of the association and to the added impetus given to standardization on the railways as a result of his work.

Continuing its report, the committee discussed A.R.A. representation in the American Standards Association, the relations between the A.S.A. and the National Bureau of Standards, the status of subjects recommended for national standardization, and the status of A.R.A. recommended standards for railway-highway grade crossing protection. The report also included a statement in regard to the activities of the Canadian Engineering Standards Association, prepared by B. Steward McKenzie, secretary. As appendices to the report, the committee presented a list of the standards approved by the American Standards Association between September 1, 1932, and September 1, 1933, and a list of the American Standards Association technical projects on which the railway associations are now co-operating.

In presenting the report of the committee, Chairman Irwin emphasized the desirability of a wider use of the association standards and urged all members who find any of these standards unsuitable for the conditions on their roads to communicate at once with the chairman of the committee who has the particular

subject under consideration, so that provision can be made to add to the flexibility of the standards and thus insure a wider range of usefulness and application.

Report on Ties

W. J. Burton, Chairman*

In a report presented largely as information, the committee covered 9 of the 11 subjects assigned to it. Certain revisions were recommended in the standard specifications for cross and switch ties to make them more exacting in several respects.

Adherence to Standards—The committee reported that the consumption and production of ties continued subnormal during 1933, and that producers generally had stocked as many ties as they had shipped. Furthermore, that stocks were being replenished with ties of excellent quality. However, it viewed the possibility of railway requirements quickly draining the relatively small supply on hand and deplored the possibility of the roads resuming a former practice of meeting competition in procuring ties through lowering the quality and size of the ties accepted. It stressed the importance of maintaining rigid standards of inspection, even in the event of a shortage, and gave evidence to show that close adherence to standard specifications is desirable from the standpoint of the producer as well as the railways.

Revision of the Manual—The committee pointed out that as a result of the closer adherence to the tie standards by the railways as a whole, and the strengthening of the specifications of certain roads by the lowering of manufacturing tolerances, the standard of tie production has been raised generally and calls for appropriate changes in the present standard specifications for both cross and switch ties. Two specific changes were recommended for adoption; one having to do with the splitting of ties, reducing the allowable split from 10 in. to 5 in., and the other making more stringent the requirements as regard to size. The committee also recommended the necessary changes in certain illustrations in the Manual to correspond with the revised specifications. All of these revisions were approved.

Substitute Ties—As in former years, the report consisted of a summarized statement of tests of substitute ties being conducted on a number of roads. No new tests were reported during the year, and several tests usually reported on in some detail were not included.

Tie Renewal Averages per Mile—Because of requests for the earlier publication of its renewal statistics, the committee this year made a preliminary report on this subject, which was published in Bulletin 356, dated June, 1933. This early report included all of the usual data for the roads of the United States, but not for the three principal roads of Canada. The figures for the Canadian roads were presented by themselves in the present report submitted.

Standard Spacing for Spike Holes for Pre-Adzed and Bored Ties—Following up the request of the Railway Tie Association in 1933 that consideration be given to standardizing dimensions and spacing in the pre-adzing and boring of ties, the committee reprinted the association's request in its report, together with the statement submitted concerning the advantages to both the tie producers and the railways, and then discussed in detail the results of a questionnaire on this subject which had been sent out to the railways by the Tie Producer's Association. It was pointed out that the information secured through the questionnaire, which was submitted in exhibit form, substantiated the contention regarding the radical lack of agreement on the spacing of bored holes and the adzing of ties.

Following a discussion of the causes and possible remedies for this wide variation, the committee recommended that the subject be reassigned to the appropriate committee, with certain specific suggestions for the preparation of a standard or standards of tie plates which will result in standardized adzing and boring.

Method of Predicting Tie Renewals—The committee, predicting its study on the generally known methods of predicting tie renewals, proposed a method of procedure, using tables, by which it is possible to simplify the usual method employed. Following a general discussion of renewal predictions, the committee presented tables, explained their development, and then outlined in detail, with examples, the method of determining the approximate average life of ties in track, and the procedure for making renewal predictions through the use of the tables.

Particular attention was called to the charts which accompanied this part of the report, showing that any road that has been using untreated ties begins to get the benefit of a change to treated ties within two or three years after the first of these ties are inserted. In other words, it was emphasized that the reduction in annual renewals begins almost at once rather than at the end of a period representing the average life of the un-

*General Superintendent Tel. & Sig., Illinois Central.

†Valuation Engineer, Boston & Albany.

*Asst. to Chief Engineer, Missouri Pacific.

treated ties. Attention was also called to the fact that after the last of the untreated ties are removed there will be a period of very limited renewals, and that it will be many years before a constant rate of renewals will be attained.

Tie Plates Best Adapted For Use With Pre-Adzed Ties—The committee pointed out the functions of tie plates and then discussed the effect on the "variability factor in track" of the time required for plates with different bottom designs to fully seat themselves on different kinds of ties. It expressed the opinion that the long period required for seating some types of plates with intricate bottom designs, resulted in the development of looseness between the ties and the rail as seating of the plates progresses.

Where the plate is fastened to the tie independent of the rail, the committee recommended the use of a flat bottom plate, and where not fastened to the tie independent of the rail, it advocated a flat bottom with two shallow ribs at right angles to the length of the tie. Where ribs are used, the committee recommended the grooving of the ties to receive the ribs, this to be done in connection with the pre-adzing.

Securing Tie Plates to the Ties Independently of the Rail Fastenings—Based on information received in reply to a questionnaire, the committee pointed out the two different methods of holding the rail where the plates are fastened to the tie independently of the rail, and then discussed the various possible factors involved, including the effect on tie and rail life, the effect on the amount of labor required for surfacing and re-gaging, the labor cost for making tie renewals, etc.

The consensus of opinion of those roads securing the tie plates to the ties independently of the rail seemed to be favorable as regards all of these factors, especially as regards the increased life of the ties, but the committee felt that present installations had not been of sufficient duration to permit of definite conclusions in this regard, although it admitted that increased tie life is indicated.

Methods of Inspection for Tie Renewals—In a rather extended report, the committee consolidated the information on this subject secured from 61 roads in response to a questionnaire. The different heads under which the information was presented were as follows: Field inspection to determine renewals necessary; marking ties for renewals; reporting ties to be renewed; check of original field inspection; variation between original survey and the check; inconsistencies in estimates for different territories under similar condition of tie timber, track and traffic; methods followed for tie allotments when the supply is inadequate to cover the number determined as needed by field inspection; importance of inspection of old ties taken out of track; latitude allowed section foremen renewing ties at variance with the yearly maintenance allotment; advantages and disadvantages of spotting ties for renewal; and the use of statistics as an aid to the determination of tie renewals.

As a result of its study, the committee submitted a number of conclusions which it felt would be applicable under most conditions, and which would result in the safe and economical control of tie renewals.

Other Subjects—Following instructions, the committee made no report on best practices, from the manufacture to the installation of a tie in the track, and on the economics of the use of ties longer than eight feet.

Iron & Steel Structures

A. R. Wilson, Chairman*

The work of the Committee on Iron and Steel Structures during the year was concentrated on the consummation of revisions in the standard specifications for steel railway bridges. As a result, completely revised specifications, covering fixed spans not exceeding 400 ft. in length, were submitted to the association with the request that they be received at this time as information. The new specifications, which are referred to as "First Edition" and dated March, 1934, include 52 pages, and are divided into three parts—Part I, Design and Manufacture; Part II, Materials, and Part III, Alloy Steels. Under Part I, the main sections cover proposals and drawings, general features of design, loads and stresses, unit stresses, details of design, workmanship, full-size tests of eye-bars, and weighing and shipping, these embodying a total of 138 separate articles. Part II includes a total of 94 articles in the following sections: Structural and rivet steel, structural silicon steel, structural nickel steel, steel forgings, cast steel and cast iron. Part III, covering alloy steels, embodies nine articles.

As Appendix A to the specifications, the committee presented the secant formulas which serve as the basis for the parabolic

formulas for column unit stresses given in the articles dealing with unit stresses. It was pointed out that the parabolic formulas for axial compression given in the specifications fit the values obtained by the secant formulas so closely that they may be used without substantial error for slenderness ratios within the limits shown.

The specifications submitted embody the work of the committee on the following assignments: Tests of steel columns and formulas for design; use of alloy steel for structural purposes; impact on railway bridges; and the bearing value of small rollers.

M. Hirschthal (D. L. & W.) called attention to the fact that at a span length of 175 ft. there is a point of abrupt change in the application of impact loading on a double-track bridge. Below this point impact is applied to both tracks and for longer spans the application is to one track only. He suggested the use of some sliding scale of change so that the application would be made gradually instead of abruptly. In this he was supported by Theodore Doll (A. T. & S. F.), who also suggested that the committee publish the supporting data upon which this and other provisions of the specifications are based. Chairman Wilson replied that it was the committee's intention to do this.

Other Subjects—The committee reported progress on its assignments covering the following subjects: Specifications for fusion welding and gas cutting for steel structures; design for rivet heads for steel structures; stresses in wire rope bent over sheaves; different grades of bronzes to be used for various purposes in connection with iron and steel structures; design of expansion joints involving iron and steel structures; and design of tension members, and connections in which rivets develop tension.

Report on Grade Crossings

J. G. Brennan, Chairman*

The committee reported in detail on four subjects, including a study of the relative economy of different types of highway grade crossings, and recommended the adoption of several specifications.

Street Crossings Over Railway Tracks—After two year's study, the committee presented the three following new specifications for adoption and inclusion in the Manual:

(1) Specifications for the preparation of the track structure, width of crossing and approaches for the construction of street crossings over railway tracks; (2) specifications for the construction of rail-type street crossings; and (3) specifications for the construction of wood plank street crossings. These were adopted with minor revisions.

It also submitted as information, specifications for the construction of highway crossings surfaced with oil-processed gravel.

The committee reported that all four of the specifications had been submitted to the Roadway committee of the American Society of Municipal Engineers and to the American Transit Association, and that no exceptions were taken.

Different Types of Highway Grade Crossings—Studying this subject from the standpoint of relative economy, the committee gave consideration to all of the various types of crossings used to any extent, including treated and untreated plank, asphalt plank, solid concrete, concrete plank and concrete slab, rail, metal plate, and bituminous. Under the last mentioned type it included ready-mixed, mixed at the crossing, and natural rock asphalt. Referring to the types of crossings included in its study, the committee reported as follows:

It will be noted that practically all of the crossings named will make satisfactory crossings if properly constructed and maintained. As there are so many varying conditions at different crossings, we cannot recommend any of them as best for all crossings. Particular attention is called to the fact that none of these crossings will give satisfactory results unless special attention is given to preparing the subgrade and track for the crossing. The track should be well drained, well ballasted, well tied, well tamped, and lined and surfaced before the crossing is put in.

As a part of its report, the committee included a tabulation of some of the advantages and disadvantages of the various types of crossings; a list of the factors which should be taken into consideration in determining which type of crossing is the best and most economical for any particular crossing; and a formula for assisting in determining the most economical type. Since one of the principal items called for in the formula is the estimated life of the crossing, the committee presented data concerning the life of the various types of crossings, based on information received from a large number of roads. The

* Engineer of Bridges and Buildings, Pennsylvania.

* Engineer Grade Crossings, New York Central.

committee stated that the figures submitted may or may not be of value as showing the comparative average estimated life of the various types of crossings, depending on whether conditions at the crossings are similar.

Vertical Curves on Highways for Separation Projects—This report, which was recommended for inclusion in the Manual, presented clearly the problem of the vertical curve on highways in connection with grade separation projects, and pointed out the prevailing and best practices in this regard under various circumstances. In concluding its report, the committee said:

The design of vertical curvature should be made to fit the conditions, eliminating any tendency to treat all sag curves in terms of vision curve lengths, or to treat city grade separation vertical curves in terms of the unrestricted sweep and speeds of the open road. There is a balance of safety and economy attainable in every case, which, if fairly and intelligently considered in the light of a weighted average of all the factors involved, invariably determines vertical curve lengths of greatest advantage. Beyond the limits of safety and utility, the vertical curvature required should be the sole responsibility of the initiating party. Minima of a 10-ft. length for each 1 per cent of change in gradient for vertical curves in urban grade separation projects, and a 15-ft. length for each 1 per cent of change in gradient for highways outside of cities, are suggested. Sight distance curves merit special designs.

The committee recommended that the depression or elevation of highways required for separation from railroad grades be effected with the minimum of vertical curvature required for safety and utility. This recommendation was adopted for publication in the Manual.

Stop-and-Go Signal at Highway-Railway Crossings—The committee investigated the merits and economy of the stop-and-go type of signal, (commonly used at street intersections) with red and green illuminated aspects, as a protective device at highway-railway grade crossings, and on both points it opposed the signal, pointing out specific objections and answering the claims of its proponents. At the end of its report it offered the following conclusion, which it recommended be approved for publication in the Manual and be called to the attention of the Joint Committee on Grade Crossing Protection, A. R. A.:

"Stop and Go" signals should not be used for the protection of railroad-highway grade crossings where they are operated exclusively by the passage of trains, and their use should be confined to special locations where their observance can be enforced by police power.

Other Subjects—The committee reported progress in its consideration of revisions in the Manual, which concern the proper lighting of the base of signals where located in the center of the highway, and recommendations with regard to center-road installations of flashing-light or wig-wag type signals. It also reported progress in its study of the economic aspects of grade crossing protection in lieu of grade separation.

Economics of Railway Location

F. R. Layng, Chairman*

The only subject reported on by the committee had to do with "Rise-and-Fall." After study of the many varied definitions were included in its report, the committee formulated the following definition, which it submitted for adoption: "Rise-and-fall" is the sum of the vertical ascents in rising from a starting point or level to a summit, and returning to the same point or level, inclusive of all grades on the profile between any two points or termini. It is mathematically expressed by the formula

$$\text{Sum of ascents in one direction} + \text{Sum of descents in same direction}$$

2

The committee pointed out that while the mathematical definition submitted may be used to obtain a mental comparison of two profiles, the figures obtained therefrom cannot be used in a concrete way for estimating the relative operating expenses of the two profiles. The committee then discussed in some detail the effect of rise-and-fall and the various classes into which it must be divided in order to determine the relative operating characteristics of different profiles. It stated that the use of the number of vertical feet to express rise-and-fall, without qualifications, as an aid in judging between two locations may mean practically nothing, and presented three sample profiles to demonstrate this point.

As regards the items of operating cost affected by rise-and-fall, the committee reported as follows:

The main effect of rise-and-fall is on fuel and time. At the present time, the committee is not prepared to offer any method of determination of the effect of rise-and-fall on these items

of operating expenses, or to state whether other items of operating expenses are affected, and to what extent.

The report was received without discussion.

Report on Roadway

Geo. S. Fanning, Chairman*

The committee made detailed reports on five of the nine subjects assigned to it, and offered recommendations for important additions to the Manual in connection with methods of roadbed drainage, methods of protection against drifting snow and of opening snow blockades, and methods of protection against drifting sand.

Methods of Roadbed Drainage—The report concluded the committee's consideration of this subject in accordance with the outline adopted in 1931. In it the committee submitted, for adoption and inclusion in the Manual, information concerning the maintenance of ditches; ditching machines; the maintenance of drains, including French and rock drains; soft spots; water pockets; and slides. It is intended that this new information should follow that material on related subjects adopted at last year's convention.

In addition to the new material submitted, the committee recommended a number of revisions in material appearing in the Manual. The three-fold purpose of these revisions was stated to be as follows: To bring the definitions and the specifications for the formation of the roadway into harmony with the recommended practice adopted for roadbed drainage; to remove from the Manual present matter on slides, water pockets, soft spots and ditching, the substance of which is obsolete or included in the material presented this year for adoption; and to replace the figure on Page 41, illustrating drainage, with more comprehensive plates. The new material was adopted for inclusion in the Manual and the recommended revisions were approved.

Jacking Culvert Pipe Through Fills—The report, which was quite detailed, was based on information furnished by a large number of railways, the Armco Culvert Manufacturers Association, the Ingot Iron Railway Products Company, the Massey Concrete Products Corporation, and the State Highway Department of Ohio. In the words of the committee, the report was made to provide a source of information for those unfamiliar with work of this kind and with how to prepare cost estimates covering it.

At the end of the report, which was submitted with the recommendation that the subject be discontinued, the committee offered the following conclusions:

Where conditions are suitable, the placing of pipe culverts by the jacking process is feasible and will save from 30 to 50 per cent of the cost of placing the pipe by the open trench method. It will also be cheaper than tunneling. Pipes have been installed by this process in practically all types of material, from rock to quicksand. The advantages of the method are: Usually lower cost; no interruption of traffic; and minimum disturbance of the roadbed, and consequently little or no subsequent settlement.

This method is particularly applicable where more than one track is involved, where the fill is high, where the material to be penetrated is clay or similar soil that will arch or stand up well, and where traffic is heavy.

Costs will be higher, although not necessarily prohibitive in unstable soils and embankments containing boulders, stumps, waste from rock cuts, or similar obstructions.

Before it is decided that jacking is the proper method to use, all conditions involved in the operation should be investigated and, if the economy to be obtained appears doubtful, cost estimates for open cut placement or tunneling should be compared with the probable cost for jacking. Such estimates should include the expense due to interference with traffic, and excess maintenance until the embankment becomes stabilized. Generally, jacking operations will have little or no effect upon the stability of the track and, if subsequent settlement is experienced, it will be very slight.

Bearing Power of Soils—The scope of the assignment and report this year was enlarged beyond that of the bearing power of soil, to include other physical properties of soils, and, in addition, consideration of their effect upon roadbed performance. In its discussion of the enlarged subject, the committee indicated a number of respects in which soil engineering is undergoing changes and called attention to a number of factors having a direct effect upon the bearing power of soils, but seldom taken into consideration.

In addition, the committee submitted a glossary of soil terms covering soil identifying terms, texture, structure, consistence, compactness and cementation.

*Chief Engineer, Erie.

Methods of Protection Against Drifting Snow and of Opening Snow Blockades—The report, which was prepared in collaboration with the Committee on Maintenance of Way Work Equipment, was a reconciliation of the report presented last year covering methods of protecting against drifting snow and of removing snow on the line and in yards and terminals, with the matter now appearing in the Manual on snow fences, snow sheds and methods of snow removal. The main purpose of this reconciliation was to bring up to date and enlarge the present material in the Manual, which was adopted in 1909, 1910 and 1915.

The present report, which covered all phases of the subject under the two main heads, "protection against drifting snow", and "opening snow blockades", was submitted for adoption and substitution in the Manual for the present material referred to above. The methods outlined were approved for insertion in the Manual.

Protection Against Drifting Sand—The report on this subject is rather unique in that it consisted of short and extended quotations from letters received by the committee from railway and highway engineers in many parts of the world, including the United States and Canada. After careful consideration of the information in hand, the committee arrived at a number of conclusions, which it recommended be approved for inclusion in the Manual. These conclusions were adopted for inclusion in the Manual.

Other Subjects—The committee reported progress on the following assignments: Study the service life and prepare specifications for railway fence wire; specifications for galvanizing metal culvert pipe; and the service life of culverts. It offered no revisions in the Manual other than those made in the two reports covering roadbed drainage and protection against snow.

Rivers and Harbors

W. C. Swartout, Chairman*

The committee reported in some detail on six subjects relative to river bank protection, harbor facilities and bridges over navigable waterways. It recommended no additions to or revisions in the Manual.

Specifications for Different Types of River Bank Protection—Under this assignment, the committee submitted detailed specifications covering the furnishing of all material, labor, plant equipment, machinery and tools, and therewith the constructing, erecting and installation of a pile diversion dike and a foot bankhead and revetment.

Fender Systems for Protecting Wharves—Following a general discussion of the functions of fenders and the various factors to be taken into consideration in adopting a particular design, the report covered at some length the design, and the specific functions and details of the three different types of fenders—fixed, spring and floating. Sketches were submitted of the different types by way of illustration and reference was made to certain important relatively recent installations.

Warehouse Piers, Coal and Ore Piers, Car Float Piers and Other Types—The report was confined to a consideration of coal and ore docks. After pointing out that the coal and ore wharves or piers on the Great Lakes are called docks, the committee discussed in detail the two general classes of such docks, viz. those designed to load coal or ore into vessels, and those designed to receive the same commodities at the delivery port. Throughout the report, reference is made to specific railway-owned docks, and a list is presented showing a number of important facts concerning the ore loading docks on the Great Lakes.

As a part of its report, the committee presented a bibliography of published articles describing the more important coal and ore docks in the country.

Clearances Over Navigable Waters—In a brief introductory report covering the economic principles involved in clearances over navigable waterways, the committee warned that the actual and proposed development of inland waterways in the United States have the effect of placing an increased burden upon the operations of land transportation, usually traceable to the excessive clearance requirements demanded for bridges over streams that are considered navigable. It said that study of typical cases had shown that in every case the clearances demanded were unduly excessive and unnecessary in the light of modern tendencies in watercraft design, construction and operation. The committee estimated that the excess annual cost to the railways of the country resulting from these burdensome

requirements, represents a sum, which, capitalized at five per cent, amounts to at least \$200,000,000.

Following the presentation of this portion of the report, the following resolution, offered by Vice-President R. H. Ford (C. R. I. & P.), was adopted: Resolved, that this association is in accord with the principles set forth in the report of the Committee on Rivers and Harbors with respect to clearances over navigable waterways, and which are to the effect that proper clearances for navigable streams are those which will not unduly interfere with the operation of either land or water transportation; cause unwise expenditures to be made for physical readjustments; or place burdensome restrictions on their future expansion; and that there must be an economic balance in the interest of both forms of transportation.

Cost to Railways for Construction, Maintenance and Operation of Bridges Over Navigable Waterways—The committee pointed out that the statutes of the United States pertaining to navigation and navigable waters which affect the cost of construction, maintenance and operation of bridges over such waterways, are based on the theory that there is an inalienable right inherent in the use of a waterway and that all forms of land transportation must be subordinate to this right. It took issue with this theory and called attention to the unfairness and unreasonableness of the demands being made on land transportation agencies. To convey its opinion of the principles which should govern in providing funds for the construction, maintenance and operation of bridges, including approaches, over navigable waters, the committee submitted a group of such principles, which it believed to be thoroughly equitable.

F. E. Morrow (C. & W. I.), chairman of the subcommittee, submitted the following resolution and moved its adoption:

Resolved: It is the sense of this association that the principles set forth in the report of the committee as to the allocation of the expense of the construction, maintenance and operation of bridges and other collateral facilities over navigable waterways are equitable. The motion was carried.

Definitions and Terms—The committee submitted as tentative, for suggestions, 32 definitions of terms having to do with subjects with which it is concerned.

Revision of the Manual—The committee offered no revisions in the Manual, but reported that it is reviewing the material therein which has been submitted heretofore by other committees, but which would now properly come within the scope of its work.

Other Subjects—Progress was reported on the following subjects: Types of bulkheads, jetties and sea walls; suitable types of construction for levees, dikes and mattresses for use under varying service conditions; size and depth of slips required for the economical operation of the various types of wharves and various traffic conditions; and harbor structures.

Signals and Interlocking

P. M. Gault, Chairman*

The committee presented detailed reports on three of its assignments, which it submitted as information. In addition, it advised that, as directed, designated members of the committee had co-operated with the Committee on Grade Crossings in a study of automatic highway crossing protection, and with the Committee on Clearances in furnishing to it information pertaining to signals and interlocking.

Developments in Automatic Train Control—The committee listed the names of various roads which, since its last report, as printed in the Advance Notice for the May, 1933 meeting, have filed petitions with the Interstate Commerce Commission for modification of train control orders. It also showed the results of such petitions as of October 18, 1933. Eight roads had petitioned the Commission to be permitted to discontinue operation of automatic train control. In two cases the petition was granted; in four cases it was denied; and in two cases decision was pending.

Seven roads were shown as petitioning the Commission to be permitted to discontinue automatic train control and, instead, to operate by cab signals in conjunction with wayside signals. In all but one of these cases, where decision was still pending, the petition was granted.

Concerning the discontinuance of train control, the committee reported as follows:

The operation of a total of 1738 track miles of automatic train control, not including the Alton and the Southern Pacific (decision pending), has been discontinued by I. C. C. authority, involving a reduction of 640 locomotives and 10 motor cars from the total equipped. Installations changed from

* Assistant Engineer, Missouri Pacific.

* Signal Engineer, Missouri Pacific.

train control to cab signals total 3155 track miles, not including the Boston & Maine (decision pending) involving 1876 locomotives and 295 motor cars of the total originally equipped with automatic train control.

The committee reported that the Committee on Automatic Train Control has continued its studies on interchangeability, but has refrained from initiating further field tests and experiments because of unfavorable economic conditions and because of the fact that certain types of devices are being eliminated from present consideration. However, it advised that this committee still considers the subject worthy of consideration.

As a part of its report, the committee presented two exhibits, A and B. Exhibit A, which was prepared by the Committee on Automatic Train Control, was a set of proposed standard aspects and indications for continuous automatic cab signals, and Exhibit B included the specifications and requirements for the continuous automatic cab signal system prescribed by the I. C. C. for the following roads, all of which have wayside signals: Norfolk & Western; Delaware, Lackawanna & Western; Pennsylvania; Reading; Central Railroad of New Jersey; and Long Island. The committee also reported that the Committee on Automatic Train Control and the Bureau of Safety are continuing to co-operate in investigations that appear desirable, in order that information may be secured with respect to the irregular functioning of apparatus.

Centralized Traffic Control—In both its 1932 and 1933 reports, the committee discussed the economic results of centralized traffic control installations. In its present report, it pointed out that in addition to definite money savings due to the discontinuance of block and interlocking stations, and the increase in gross ton miles per train hour, there is an increase in the margin of safe operation, which results in intangible benefits and savings which cannot be determined definitely, but which are real nevertheless. To call these savings and benefits to the attention of the members of the association, the committee listed them and discussed each briefly, there being a total of 22 different items.

Current Activities of the Signal Section—This report included a statement of the investigations which the Signal Section, A. R. A., made from March to November, 1933, and lists of the specifications, drawings and requisites which have been revised. It also included in list form the new specifications and drawings prepared, and the specifications, drawings, recommendations, requisites and forms to be removed from the Manual.

The report was received without discussion.

Economics of Railway Labor

Lem Adams, Chairman*

The committee reported on five of its eight assignments, and offered for approval suggestions and forms for programming bridge and building work, and a number of revised plans for the construction and arrangement of outfit cars for maintenance of way employees.

Reducing Work Train Service—At the outset of its report the committee called attention to and offered figures to show the reduction in the work-train mileage of the roads of the United States. From the figures presented, it pointed out that, whereas the average work-train mileage in the five-year period 1916 to 1920 was 42,941,206, the average mileage in the seven-year period 1923 to 1929 was only 35,101,949, and in 1932 was only 8,066,621. Following a detailed discussion of different measures taken by a number of roads to reduce work-train mileage, based upon answers to a questionnaire, the committee offered 10 specific suggestions in conclusion.

Programming of Bridge and Building Work—In this report, the committee offered for adoption and inclusion in the Manual a number of suggestions and guides for the proper programming of bridge and building work, concerning both the maintenance of existing facilities and additions and betterments to existing facilities. In connection with these suggestions, the committee submitted three forms for adoption; one to be used in connection with the inspection for the annual bridge and structure program; the second for listing the projects included in the annual bridge and structure program; and the third, entitled Annual Bridge and Structure Force Program, to be used by division maintenance officers in scheduling the work to be done by each force. These suggestions were adopted for inclusion in the Manual.

Revised Plans for Outfit Cars—Following a number of general remarks concerning the housing of maintenance of way employees, the committee submitted for inclusion in the Manual, revised plans for outfit cars to be used for this purpose. Realiz-

ing that for almost every condition some special consideration must be given to meet the problems presented most effectively, the plans prepared were made so that suitable alterations can be made readily to suit the required standard of living, the particular size of gang, type of work, or other specific considerations.

As a guide to the considerations that should enter into the design of outfit cars, the committee offered 10 specific suggestions. It also offered brief conclusions for adoption, from which the following is taken:

Your committee recommends that the living conditions of outfit cars be made as comfortable and sanitary in accordance with these general plans as economic considerations permit. These plans were approved for publication in the Manual.

Operations of Roads That Have Greatly Reduced Labor Requirements—The committee reported that it had made a second trip of inspection over the Lehigh Valley, and that while it had secured considerable additional data, it was not in a position to present it this year.

Gang Organization and Maintenance Methods—The committee reported that it had continued to investigate the time studies now appearing in the Manual with a view to revising those that are not representative of modern practices, and, further, that it was giving special consideration to developments in the matter of mechanical tie tamping.

Other Subjects—Progress was reported by the committee in its consideration of revisions of the Manual and the economics of different methods of killing weeds. It stated that as regards the effects of recent developments in maintenance of way practices on gang organization, it was unable to develop any additional information, and recommended that the subject be discontinued for the present.

N. R. A. A. Holds Annual Meeting

THE National Railway Appliances Association held its annual meeting at the offices of the association, 910 South Michigan avenue, Chicago, on Monday, March 12. Alex Chapman (Rail Joint Company), president of the association, presided over the meeting. He reviewed the negotiations with the Signal section, American Railway Association, and with the American Railway Engineering Association, looking to the resumption of normal programs for "engineering week" in Chicago. When it became evident late last November that it was not practical to resume this program in its entirety this year, the exhibit was again postponed.

The report of C. W. Kelly, secretary-treasurer, showed the continued active interest of the membership in the association. He reported a small surplus in the treasury.

The following officers were elected for the ensuing year: President, W. Homer Hartz, president, Morden Frog & Crossing Works, Chicago; vice-president, James O'Leary, Jr., Johns-Manville Corporation, Chicago; directors (three years), E. D. Cowlin, Eaton Manufacturing Company, Reliance division, Cleveland, Ohio; H. H. McDonough, Lorain Steel Company, Lorain, Ohio; and C. H. White, Industrial Brownhoist Corporation, Chicago.

After taking charge of the meeting, Mr. Hartz expressed the opinion that every effort should be made to present an exhibit next year, believing that the supply industry could render a constructive service to the railways by this action in view of the marked progress that has been made in the design of equipment and materials since an exhibit was last presented. This suggestion aroused active discussion which showed that the large majority of those present favored this action. At the conclusion of the discussion, it was voted to advise the officers officially that it was the sentiment of the membership that plans should be made for an exhibit next year.

*Chief Engr., Oxweld Railroad Service Co.

Signal Section Meets in Chicago



J. E. Saunders
Chairman

Sessions of two-day annual convention dealt with economics, highway crossing signals and new apparatus



H. G. Morgan
Chairman-Elect

THE fortieth annual convention of the Signal Section, A. R. A., was held at the Stevens Hotel, Chicago, on Monday and Tuesday of this week. This association, which was formed as the Railway Signal Club in 1895 and was known as the Railway Signal Association from 1903 to 1919, is one of the few organizations of railroad officers which have continued their meetings in recent years. J. E. Saunders, signal engineer of the Delaware, Lackawanna & Western, presided as chairman of the meeting. R. H. C. Balliet, secretary, reported the membership in the section to be 1,969, with 35 new members added during the year. The attendance at the convention was 275.

In addition to the presentation of the reports of committees, M. J. Gormley, president of the American Railway Association, and Samuel O. Dunn, chairman of the *Simmons-Boardman Publishing Company*, and editor of the *Railway Age*, spoke on Monday afternoon. Mr. Gormley made a brief extemporaneous address in which he stated that the American Railway Association was willing to extend to the Signal Section all co-operation in promoting research and development. He referred also to the proposal just made by Federal Co-ordinator Eastman that all systems of transportation be brought under regulation by the Interstate Commerce Commission, stating that if this suggestion was made effective, the railroads would, within the next five years, be in the best position of their history. The addresses of Mr. Saunders and Mr. Dunn are abstracted in the following.

Address of Chairman Saunders

Signal engineers have sometimes been called to task for their tenacity in demanding better materials and more reliable operating devices. It is this care, backed up by their managements through experience, that has largely been responsible for the high degree of safety now existing in train operation. During recent years the necessity for meeting new conditions—heavier equipment, higher speeds and greater economy—has brought about the development of new systems and means of substituting the more reliable and uniform operation of machines for man-power. Thus we have train operation by signal indication, automatic interlockings, remote control of switches and signals, centralized traffic control, car retarders and improved automatic highway grade crossing signals. Responsibility has also been placed on the signal engineer to determine the extent to which parts stand-

ardized in other fields may be applied to railway signaling without reducing the factor of safety.

We must be circumspect in our consideration of standardization. Its primary purpose is to reduce expense, but it can easily be the cause of an increase in cost by the introduction of new or compromise designs, not justified and not interchangeable with others in general use; also, when the quantities that are required are small, the expense of developing and revising standards from time to time may exceed any probable saving. The Signal Section early recognized the desirability of having standards that come within due bounds. At a recent conference attended by your representatives, Mr. Lockwood, director of the section of purchases on the staff of the Federal Co-ordinator, pointed out that a standard may be changed as often as once a year, but experience has shown that most of them are in active use for many years before they are revised or superseded.

The Signal Section cannot hope to go into the design of more intricate apparatus with the hope of standardization. There are not sufficient trained men available for this service and in any case it is more properly within the province of the manufacturers. However, there is a field in basic materials and detail parts used in quantity that particularly warrants consideration by Signal Section committees. Such consideration must include investigation of specifications, designs and standards already established by other divisions and sections of the A. R. A., as well as in other fields. Arrangement for this co-ordination is well under way. Where there is danger of lowering the standard of safety in protecting traffic, we should not hesitate to adopt a standard more exacting than those of other bodies. In the consideration of standards, however, it is essential that manufacturers of railway signaling appliances be consulted, and this is provided for by an arrangement whereby their representatives attend subcommittee and committee meetings.

It is recognized that the primary function of the railways is to provide safe and expeditious transportation of persons and goods. Railway members of the Signal Section do not have much time for research investigations. For this reason, research activities are being conducted largely by manufacturers who specialize in railway signaling appliances. Here scientists, physicists and engineers are at work on basic research problems that later grow into developmental projects. Our railway members are then called upon to continue the work in the field, so that when drawings and specifications are presented to the Section for approval they are not only well grounded in science but also practical in application. Thus the railroad supply industry provides most of the research laboratory facilities and the railroads supply the proving ground. Many times the developmental work in the field is greater in scope than the research activity which preceded it.

We are passing through a period that is critical for the railways. Ours is the responsibility for safeguarding traffic at the

lowest consistent cost. The railways, through the A. R. A., look to the Signal Section for recommended standards and co-ordinated effort to secure improvements in signals and interlocking. In the organization of general committees on research, standardization, etc., this Section is recognized officially.

Address by Samuel O. Dunn

The railroad business is getting better. Measured by freight car loadings, both general business and railroad business are now the best they have been since 1931, so there is a sound basis for a feeling of optimism as to the immediate future of the railways. We have already made progress of a substantial sort: we are continuing to make it and we all hope that it will continue. Much more than hope will be required, however, completely to revive our production and commerce, which are still in the aggregate about 35 per cent less than they were in the five years, 1925-1929, and nobody can make any intelligent forecast of business in general, or of railroad business in particular, without considering certain influences which never affected business in any previous period when it was recovering from a depression. I am referring, of course, to economic policies which are being followed, and others which are being advocated for adoption by the federal government.

Whether the improvement in business now so well under way will continue seems to depend principally upon these policies. The proposal for further general reductions of working hours and advances of wages in industry under present conditions is, in my opinion, a serious menace to continued improvement in business. The reasons for this could not be better illustrated than by the effects that would be produced upon the railroads and the industries from which they make purchases by the passage by Congress of the bill now before it to establish a 30-hr. week for the railway employees, with the same compensation for 6 hrs' work that is now paid for 8 hrs' work.

All real students of the depression know, and General Johnson in his speech on March 7 emphasized, that it now exists principally in the "durable," or "capital," goods industries, and in the "service" goods industries which depend largely upon the "durable" goods industries for business. The railways are normally among the largest purchasers from the durable goods industries, having in the five years, 1925-1929, bought from them an annual average of \$1,281,000,000 worth of equipment and supplies, but only \$282,000,000 worth in 1933, a reduction of 78 per cent.

The bulk of these purchases is made from net earnings or with capital raised by issuing securities which cannot be sold to investors unless there are actual or prospective net earnings with which to pay a return upon them. Therefore, a large increase in railway net earnings is indispensable to a large increase in railway purchases from the durable goods industries and to increased employment in those industries.

Now let us consider the effects that would be produced immediately upon the durable goods industries by the establishment of a 30-hr. week on the railroads. This would increase the annual operating expenses of the railways \$600,000,000, an amount largely exceeding the total net operating income they earned in either 1932 or 1933, and almost one-half as great as the largest amount of net operating income they ever earned in any year. If this increase in railway operating expenses were not offset by an increase in railway rates, it would absolutely stop the increase in railroad buying from the durable goods industries that recently has begun, and probably would reduce it to even less than it was in 1932 or 1933. If railway rates were advanced to offset the increased cost of the 30-hr. week, the burden thereby imposed upon farmers and all other producers and shippers would retard or arrest the revival of business in every branch of industry and commerce.

It may be said that the increased employment and payroll of the railways would increase the purchasing power of their employees. But railway employees, like other wage earners, buy consumers' goods, not durable goods, and, therefore, the increase in their purchasing power would not stimulate business in the industries in which stimulation is most needed; while the reduction in the purchasing power of the railways would intensify and protract depression and unemployment in the industries in which stimulation is most needed, and thereby would intensify and protract the depression in other industries.

These facts and their significance should be plain to every

person with any knowledge of the economics, industry and business of this country. For almost a year the government has been proceeding upon the false assumption that reduction in the working hours and increase of the pay of wage earners would increase their purchasing power and restore prosperity. The improvement in business that has occurred within the last year is construed as an argument for more drastic application of the same policy. This disregards vitally important facts. The improvement in general business, as is conclusively shown by railway car loadings, did not begin within the last year, but in the summer of 1932. It was resumed immediately after the banking moratorium a year ago, before the present recovery policies were adopted, was arrested in the fall of 1933 after they were adopted, and resumed again late in 1933 only after business had been able partially to adjust itself to them. The improvement, while substantial in the consumers' goods industries, has been comparatively small in the durable goods industries, and it is for this reason that it is vitally important that all policies shall have as their major objective revival of the durable goods industries.

These facts are being very forcefully presented to those responsible for government policies. They have never been more forcefully presented than in an address that was delivered at the recent N. R. A. conference in Washington by George H. Houston, president of the Baldwin Locomotive Works, and there is no industry which more imperatively needs to have government attention effectively called to it than the railway equipment and supply manufacturing industry, which, after having suffered terribly during the depression, is just beginning to benefit by a substantial increase in orders from the railroads. It is almost as important to the railways as to the manufacturing industry, however, that nothing shall be done which will interfere with an increase in railway buying, because a large increase in their ability to buy is essential to enabling the railways to carry out needed rehabilitation and improvement of their properties.

Lessons from the Depression

A fact of which railway men have reason to be proud is that the railways have maintained, in spite of everything, their well-deserved reputation for providing the safest transportation for passengers and freight. Proper signaling facilities, good track and steel cars have all contributed to the attainment of this good reputation, which must not be jeopardized in meeting the demands of the public for higher speeds and more convenience.

The railroads for years have carried on extensive research and development, leading to the improvement and standardization of facilities. During the past decade the developments in signaling have been outstanding, and include train control, cab signaling, automatic interlocking, remote and centralized traffic control, car retarders and highway crossing protection. So many new types of facilities could not have been developed without extensive research on the part of the manufacturers and the railroads. Many of the manufacturers in the signaling field are equipped with complete research laboratories, the service of which is accessible to the railroads. Thus adequate research and test, in the production of equipment and materials, are now, and have been for years, regular practices in the signaling field.

Much good work has been done in standardizing signaling practices and basic materials and parts. Standardization which makes all equipment, materials and practices as good as the best already available is highly desirable. There is always the danger, however, that extensive standardization may hinder progress, because the more widely any particular standard has been adopted, the more difficult it is to get it changed; and there can be no progress without change. In the long run, progress is much more important than standardization, just as initiative always accomplishes more than the best performance of an established routine, and we must guard against allowing any form or extension of standardization to interfere with continued progress.

Some of the old ways of providing railroad transportation are no longer good enough. The virtual monopoly of transportation which the railways once enjoyed no longer exists. They are faced today by universal competition from other kinds of carriers, operating on the highways, on the waterways, and in the air. This competition, because of its severity, cannot be ignored. The railways need to recover as much as possible of the traffic they have lost. How can they do this? The railways must duplicate and improve upon those features of the transportation service rendered by their competitors which have proved attractive to shippers and travelers. One thing which is urgently

needed—and it is a thing in the development of which signaling officers of the railways will have a leading part—is greater speed in passenger service and in part of the freight service.

Another improvement in railway service which is necessary if competition is to be met and overcome is an increase in the convenience and frequency of both passenger and freight service. Travelers and shippers want to get themselves or their products to destination in a hurry. Railway competitors are meeting this demand, and the railways, if they want the business at stake, must likewise meet it. With these considerations in mind, the problem faced by signaling officers of the railways is that of providing the means by which more trains and faster trains can be operated smoothly and safely and with a minimum of new capital expenditures.

As railway business improves, and as efforts are being made to meet the new requirements of modern railway transportation, an opportunity is offered for signal department officers to be of greater service to their respective railroads than ever before. Signal engineers should be well informed on matters concerning train operation as well as signaling. They should study operating conditions on the various sections of their railways. They should remember that the best way to increase average speed is by elimination of delays. The fact is that signaling is one of the keys which will open the door to the better railway transportation which is ahead of us. Signal department officers of the railways have a great responsibility and a great opportunity.

Report of Committee I—Economics

The report of the Committee on Economics of Signaling was presented by B. J. Schwendt (N. Y. C.), chairman. An important feature of the report was an extended explanation of methods for forecasting the economic value of signaling. The principal savings to be effected are reductions in pay rolls, train time, number of stops and supplies. Each of these items was considered in detail and explanations were given of methods for making accurate estimates of results to be secured by proposed signaling projects. For example, the train time to be saved can be forecast by time-distance charts, as illustrated in the report. Increased safety of train operation, the value of train stops eliminated, and fuel savings, some of the items ordinarily considered as intangible, were explained in a manner to permit intelligent consideration. The report closed with a form for an economic statement, to be used as a guide in making comparisons of costs, savings and other benefits. This report has been bound separately and will be mailed free

of charge to operating and executive officers on request.

In presenting this portion of the report, S. N. Wight (G. R. S. Co.) explained that it was based on examples rather than precepts, and that the statements were conservative. One member criticized the report as being too conservative as to the number of non-stop meets effected with c.t.c. G. K. Thomas (A. T. & S. F.) stated that during the first month that a 35-mile installation of c.t.c. was in service on the Santa Fe, 40 per cent of the meets were non-stop. In discussing the savings effected in per diem, it was agreed that such savings depend on local conditions and traffic. Mr. Taylor pointed out that one road recently set up a value of \$5 per day on certain classes of its own cars. In closing the discussion, Chairman Schwendt explained the need for making tests to determine the cost of a train stop, and expressed the hope that funds be appropriated to carry on such tests.

When discussing the items setting forth the increased safety and the intangible savings effected by centralized traffic control, E. T. Ambach (B. & O.) suggested the advantage of c.t.c. in detecting broken rails. He explained that on one section of c.t.c., 59 out of 61 broken rails were indicated on the dispatcher's control panel. In many of these cases it was possible to locate the break and make repairs without delaying trains, while in other instances trains were routed through passing tracks to avoid delays.

Economics of Car Retarders

The committee also included a report on the economic value of car retarders. The total cost of the installations cited varied from a maximum of \$1,481,000, of which \$1,390,000 was chargeable to capital account, to a minimum of \$224,000, of which \$190,000 was chargeable to capital account, while the savings in operation per car handled through the various yards varied from a maximum of \$0.55 to a minimum of \$0.087.

The reason for the variation in the cost of the installations is the fact that in several cases considerable changes had to be made in the arrangement and elevation of the classification tracks while in others, such changes represented a small portion of the total cost.

The average annual return on the sixteen installations amounted to approximately \$216,900, representing an average return on the capital investment of 42.86 per cent. The average cost per car handled through the yard

Table Showing Operating Result and Economics of Sixteen Car Retarder Installations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)									
									Average saving in operating and maintenance cost per car handled after retarders were installed									
Railroad	Total rail power-operated switches	Number of retarders	Number of skates	Average cars handled in 24 hours	Maximum cars handled in 8 hours	Approximate total cost of installation of retarders, including grade and track changes, buildings, etc.	Operation and maintenance costs per car handled through yard	Average savings based on cars handled	(a) Before installed	(b) After installed	(a) Capital investment	(b) Operating expenses	Total	(a) Before installed	(b) After installed	(c) Savings made at other yards	(d) Total estimated annual saving	(e) Estimated percentage return on capital investment
A	1,778	34	34	1,613	2,229	\$30	\$1,002	\$495,000	\$99,000	\$594,000	\$734	\$424	\$310	\$252,211	.....	\$252,211	50.95
B	864	48	46	881	1,046	819	852	430,000	109,000	539,000	.542	.455	.087	33,216	.....	33,216	7.72
C	1,540	57	57	1,050	1,800	500	1,017	363,000	15,000	378,000	.825	.605	.220	144,540	\$86,726	281,266	63.70	
D	424	17	17	715	900	300	471	190,000	34,000	224,000	.560	.290	.270	88,695	.....	88,695	46.68
E	2,155	44	37	2,200	2,200	1,000	1,000	439,000	30,000	469,000	.8495	.5938	.2557	205,327	.....	205,327	46.77
F	1,232	24	48	1,200	1,400	649	754	591,000	7,000	598,000	.471	.249	.222	113,442	.....	113,442	19.19
G	1,368	23	24	900	900	360	560	261,000	46,000	307,000	1,420	.870	.55	180,675	.....	180,675	69.22
H	1,343	25	21	1,644	2,103	1,359	1,298	381,000	78,000	459,000	.6674	.3904	.2770	212,624	.....	212,624	55.89
I*	567	35	31	1,500	1,500	874	689	485,000	63,000	548,000	.431	.205	.226	123,735	192,000	315,735	65.10	
J	1,613	29	..	1,100	1,100	390	976	514,000	4,000	518,000	.496	.343	.153	61,430	15,000	76,430	14.86	
K-1	2,541	40	40	2,988	2,878	1,096	1,186	771,000	123,000	894,000	.917	.606	.311	326,696	.....	326,696	42.37
2.	1,309	28	27	2,320	2,514	923	1,156	463,000	74,000	537,000	.917	.606	.311	285,377	.....	285,377	61.63
3.	1,540	30	31	1,205	1,490	647	1,024	667,000	53,000	720,000	.74	.581	.159	86,472	.....	86,472	12.96
4.	770	43	..	1,079	768	500	781	730,000	122,000	852,000	1.12	.81	.31	86,899	189,328	276,227	37.83	
L-1	4,373	35	..	30	2,500	..	1,384	1,390,000	91,000	1,481,000	1.29	.93	.36	328,500	.....	328,500	23.63
2.	3,246	64	..	62	2,150	3,000	1,042	1,411	680,000	177,000	857,000	.835	.417	.418	457,710	457,710	67.31

* Note.—Average estimated return on capital investment of the 16 installations is 42.86 per cent.

* Tabulation covers two yards.

before the retarders were installed was \$0.80 and after they were installed, \$0.52, representing an average saving per car handled of \$0.28. Four of the railroads reported that the installation of the retarders had resulted in eliminating switching at other points with additional savings, as shown in column 9 (c), ranging from a maximum of \$192,000 to a minimum of \$15,000 a year.

While the average number of cars handled in 24 hours in one yard was only 768 and in two others only 900, a comparatively small volume of traffic, the savings effected in yard operation by the retarder installations and other yard improvements were equivalent to a return on the capital investment of 37.83 per cent in the first yard, 46.68 per cent in the second yard and 69 per cent in the third yard. The savings effected in the first yard, 37.83 per cent, were due in part to the reduction in the amount of switching in other yards, which effected an annual saving of \$189,328.

C. A. Taylor (C. & O.), subcommittee chairman, who presented that portion of the report dealing with car retarders, supplemented it with further information regarding the car retarder installations listed in the tables, which had been in service from two to nine years, the average period of service being five years. If the rate of return shown in the report was applicable throughout the entire periods that the retarders have been in service, the 16 installations have effected savings, up to January 1, 1934, after deducting maintenance costs, operating expenses and interest charges, of approximately \$15,000,000 on an investment of \$9,975,000, or, in other words, these facilities have paid for themselves one and one-half times over.

Economics of Spring Switches

The report on spring switches was introduced with an explanation of the development and application of such equipment, including mention of the new facing-point mechanisms. A list of the spring switches in service on 69 roads shows that they number 1,366. Examples were given of the savings effected on several roads. For example, one road with 18 installations—5 at end of double track, 7 on sidings and 6 at other points—reports the elimination of 46,786 train stops and 8,760 hours of labor, with a total saving of \$35,404. The cost of the 18 installations was \$19,100, or an average of \$1,061 per installation. The annual operating charges were \$2,996, leaving a net saving per year of \$32,408, or about 170 per cent on the investment. The summary of the report stated that the savings made by spring switches are effected by reductions in delays, by eliminating train stops, block offices and interlockings, by increased safety, increased tonnage and the deferring of more expensive alternative improvements.

The report of this committee also included detailed economic studies of two projects. In one, involving four automatic interlockings on the Baltimore & Ohio Chicago Terminal, costing \$18,680, the annual saving is \$7,184. In the other at Techney, Ill., the Milwaukee installed two remotely controlled interlockings at a cost of \$27,096, chargeable to capital account, which have effected gross annual savings of \$11,312.

Chairman Schwendt, in discussing this section of the report, stated that such equipment was not adaptable to all conditions. For example, one road installed a spring switch at a location where trains frequently took up slack and as a result several derailments occurred. Under such a condition, it would be more economical to install a power switch machine instead of a spring switch. In reply to a question from the floor, Mr. Taylor explained that when making trailing movements through a spring switch on the Chesapeake & Ohio, the train speed was

limited only by the requirements established for movements through the turnouts, for example 30 m.p.h. for a No. 20 turnout. A. H. Rudd (Penna.) then asked if it is not to be assumed that the committee's recommendation was that the track layout be so arranged that the trailing movement should always be made through the turnout, to which statement Mr. Taylor agreed.

Report on Highway Crossing Protection

The report on Highway Crossing Protection, presented by A. H. Rudd (Penna.), chairman, included several suggested changes in the Manual and a report on the use of traffic-type Stop-and-Go signals at highway crossings. Paragraph No. 7 in the requisites was changed to make it a positive requirement that the signal lights must shine in both directions along the highway.

According to the report, the Southern Railway is installing and advocating the use of traffic-type Stop-and-Go, red and green signals for use as highway crossing protection. All of the members of the committee, with the exception of W. J. Eck, (Southern), agreed to a series of 15 statements, presented as a part of the report, which set forth reasons why the committee did not approve of the Stop-and-Go type of signal, the conclusion of the report being as follows: "Stop-and-Go signals should never be used where the signals are operated exclusively by trains. The use of Stop-and-Go signals should be confined to special locations where their observance is enforced by police power."

After presenting the report, Chairman Rudd offered considerable additional information regarding recent activities of various organizations concerned with highway crossing signals. He stated that several of the southeastern states, especially North Carolina, were planning to use money appropriated by the federal government to install highway crossing signals, a total of 22 such installations being under way.

Report on Signaling Practice

The report of the Committee on Signaling Practice, presented by P. M. Gault (M. P.), chairman, included a report on the status of train control on the railroads, an exhibit including the Interstate Commerce Commission's specifications for Continuous Automatic Cab Signal System, and a report concerning the elimination of train stops at automatic signals which are indicating danger.

In presenting that portion of report dealing with the status of train control, P. M. Gault (M. P.), chairman, introduced S. N. Mills (Bureau of Safety, I. C. C.), who offered an extended comment on the train control situation, making it evident that the Interstate Commerce Commission has not permitted "wholesale" abandonment of train control facilities. He expressed the opinion that if many accidents, as serious as the recent one at Binghamton, N. Y., occurred in the near future, the commission might, under public demand, require the roads to eliminate the forestalling feature. He suggested that effective supervision of enginemen was the only means of preventing the occurrence of such accidents in which the human element is involved. An abstract of Mr. Mills' remarks follows:

Automatic train control installations were at their maximum in 1932, at which time such facilities were in service on 11,881 miles of road (including 21,745 miles of track) and 10,424 locomotives were equipped. Since that date, installations have been discontinued on 1,626 miles of road (1,893 miles of track) and

715 locomotives, representing 13.8, 8.7 and 6.8 per cent, respectively, of the foregoing total installations. On the basis of the total operations for the year ended June 30, 1931, the last year for which the records are complete, the discontinued installations represent only 6.5 per cent.

In considering petitions for discontinuing the operation of train control, two questions are of principal importance: (1) Changes in traffic conditions, including reductions to a volume low enough, either temporarily or permanently, to warrant modification of the commission's requirements; (2) improvements in signal or traffic-control equipment or other changes which warrant a change in the commission's requirements. Each case is considered separately on its merits. Some of the arguments, particularly with reference to savings in maintenance, advanced in support of these petitions are not convincing, especially when put on the basis of insurance to individual trains, as this ranges from \$0.42 to \$4.13, with the majority less than \$2. In connection with any proposal for removal of these devices from service full consideration should be given to the possibility that they have played a far more important part than the records indicate in providing that freedom from accident that is emphasized in the petitions.

Under the commission's cab signal specification, the whistle is an essential element. A failure of the whistle to sound upon a downward change of the cab indications can be classified only as a false-clear failure. Such failures have been reported so frequently as to raise serious question whether proper attention is being paid to this feature from the standpoints of design and maintenance. Not only the construction of the whistle but its installation and maintenance are important. One road reported 23 such failures in 2 months, and another 11 failures in 6 months. In a cab signal system, the whistle is more than a convenience; it is an essential element. Its purpose is not only to attract the attention of the engineman to a more restrictive change in the indication, but to warn the fireman in case any action on his part is required.

The following is an abstract of the report on the elimination of train stops at signals which are indicating danger.

ELIMINATION OF TRAIN STOPS AT STOP AND PROCEED AUTOMATIC SIGNALS ON SINGLE-DIRECTION TRACK

This report was prepared on the assumption that the conclusions should apply only to Stop and Proceed automatic signals for single-direction traffic regardless of local conditions.

The following note is found on page 478 of the Standard Code which provides for the elimination of stops at Stop and Proceed signals: "Note to Rule 509-B—Railroads desiring to avoid stopping trains may arrange accordingly." The rule applies to single as well as multiple-track operation.

At the present time the practice on most of the railroads may be summarized as follows: 1. The adoption of a restricting indication, as provided by Rule 290 (page 462). 2. The adoption of Rule 509-B with "Grade," "Tonnage," or "Permissive" markers on designated signals. 3. Adoption of Special Rules:

Two railroads have adopted special rules permitting all trains to pass Stop and Proceed signals without stopping, and such signals are not equipped with any special indication or marker, the rules reading as follows:

(a) C. R. I. & P. (In service on Ill. Div. since 1923, this being time automatic train control was installed. In service on Iowa Div. since 1926, this being time automatic train control was installed.)

"On two or more tracks, when a train encounters a stop and proceed signal at stop, Rule 501-A, it may proceed without stopping, at restricted speed, if engine is equipped with train control device which is in service and operating properly."

(b) I. C. (In service since March, 1930.)

"D 282—On two or more tracks, trains may pass 'Stop and Proceed' signals without stopping, proceeding at restricted speed but not exceeding 15 miles per hour. Tonnage markers are removed."

It will be noted that the instructions are only in effect on two divisions of the C. R. I. & P. while on the I. C. they are in effect on 375 miles of track.

In presenting this report, Subcommittee Chairman

C. A. Taylor (C. & O.) explained that means are already provided by the Code for eliminating stops and that the adoption of such practices on any road should be governed by local operating conditions.

Other Reports

E. T. Ambach (B. & O.), chairman, presented the report of the Committee on Interlocking, which included revised specifications for Electro-Mechanical and Mechanical Interlocking, Automatic Interlocking, Centralized Traffic Control System and Centralized Traffic Control Machine.

E. N. Fox (B. & M.), chairman, presented the report of the Committee on D-C. Signaling, which included: (1) A revision of the formula for computing limiting resistances in series with track battery; (2) a revision of the tables of minimum limiting resistance allowable in series with track battery.

B. F. Dickinson (Penna.), chairman, presented the report of the Committee on Instructions, which included: Instructions for Maintaining and Testing Light Signals, Revisions of Circuit Nomenclature, Instructions for Inspecting and Testing Automatic Interlockings, Definitions for Technical Terms Used in Signaling, and Chapter XV—Automatic Block Signaling, which is to be included in the book, "American Railway Signaling Principles and Practices."

G. K. Thomas (A. T. & S. F.), chairman, presented the report of the Committee on Designs, which included 16 revised drawings, and 22 obsolete drawings which are to be removed from the Manual. A progress report was presented concerning reflector lenses for signals and signs, and containing statements as to work being carried on in co-operation with the American Standards Association on signs, symbols and abbreviations, and with the American Society of Mechanical Engineers on pipe flanges and fittings.

The report of Committee VII, presented by R. B. Elsworth (N. Y. C.), chairman, included additions to the Table of Signal and Interlocking Units, a report on Methods of Recording Train Control Performance, and an explanation of methods of signal cost accounting. Mr. Elsworth explained that considerable economy was being effected on some roads by distributing maintenance expenses by the unit system of accounting. The maintainers are not required to make detail reports, thus giving them more time to devote to their apparatus. Furthermore, the office work of compiling the accounts is reduced to a very simple operation, thus permitting a decided saving.

The report of the Committee on A-C. Signaling, presented by W. F. Follett (N. Y., N. H. & H.), chairman, included revised specifications on (1) A-C. Block Signal Systems, (2) Air-Cooled Transformer, (3) Electric Position-Light Signal, and (4) Low-Voltage Lightning Arrester. As a part of the report, a paper entitled "The Practical Significance of the Impulse Protective Performance of Signal Arresters," by H. M. Towne, of the General Electric Company, was read.

The report of the Committee on Overhead and Underground Lines, presented by G. H. Dryden (B. & O.), chairman, included a revised specification on Steel Reinforced Aerial Aluminum Cable and a progress report on Steel, Bronze and Zinc-Taped Cables.

The report of a new committee on Materials Research, presented by W. F. Zane (C. B. & Q.), chairman, included four revised specifications for Storage Batteries and Electrolyte, and a new specification on Non-Corrosive Binding Posts.



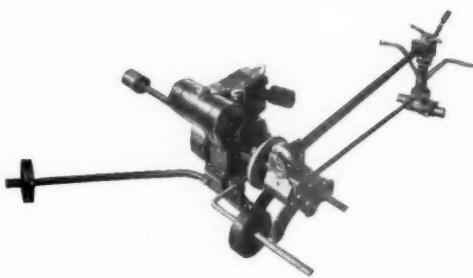
Manufacturers Are Prepared to M

Railway supply industry develops devices and materials to improve methods and efficiency

Power Tools and Power Plants



POWER TRACK WRENCH, improved by addition of overload release and more convenient control in operation. Extensively applied to out-of-face work. NORDBERG MANUFACTURING COMPANY.



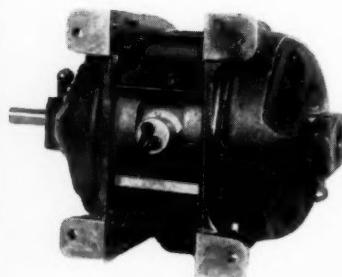
RACO NUTTER, driven by small air-cooled engine. Selective torque device permits bolt tensions ranging from 1,000 to 42,000 lb. High-speed and low-speed chucks work equally well on either side of rail. RAILROAD ACCESSORIES CORPORATION.



ELECTRIC GENERATOR CAR, for use of bridge or other gangs operating motor driven tools. Delivers both A.C. and D.C. current, powered with 15-hp. 4-cylinder engine. Equipped with retractable set-off wheels. FAIRMONT RAILWAY MOTORS, INC.

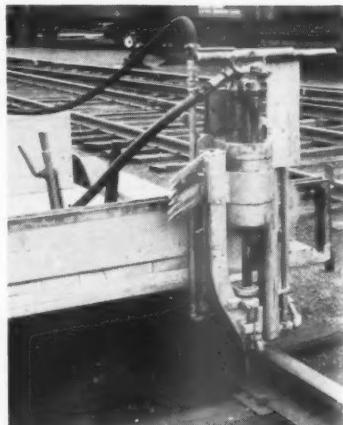


WEED BURNER, with burner and hood having adjustable mounting on end of swinging arm. Designed especially for light service and low operating cost. FAIRMONT RAILWAY MOTORS, INC.



SPIKE SETTING MACHINE, consisting of jack-hammer mounted on end of push car. Drives spikes in any position in tie. Spikes delivered automatically from magazine. Q. & C. COMPANY.

SELF - PROTECTING MOTORS with automatic control against overheating. Built-in disc thermostat combined with separate thermal overload relay, gives advance warning of dangerous temperature or stops motor. WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

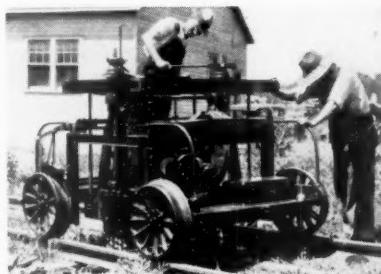
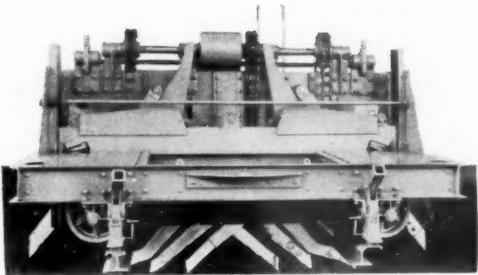


To Meet New Demands in 1934

New and improved products designed to reduce maintenance costs are exhibited pictorially

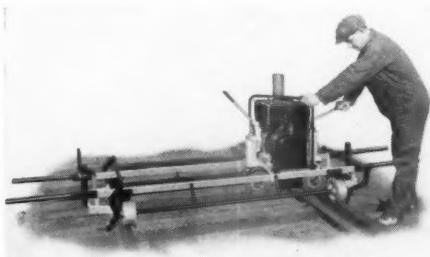
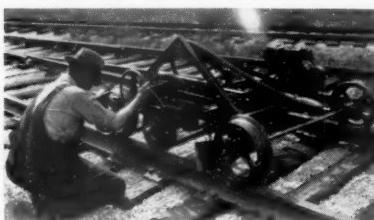
Power Tools and Power Plants

TIE CUTTER, for removing rail-cut ties from track without jacking. Gang drill cuts through ties inside of rail. WOOLERY MACHINE COMPANY.



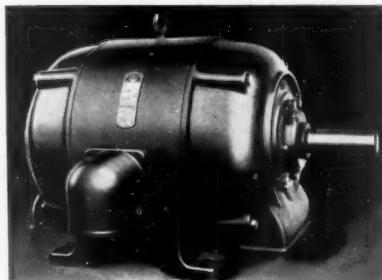
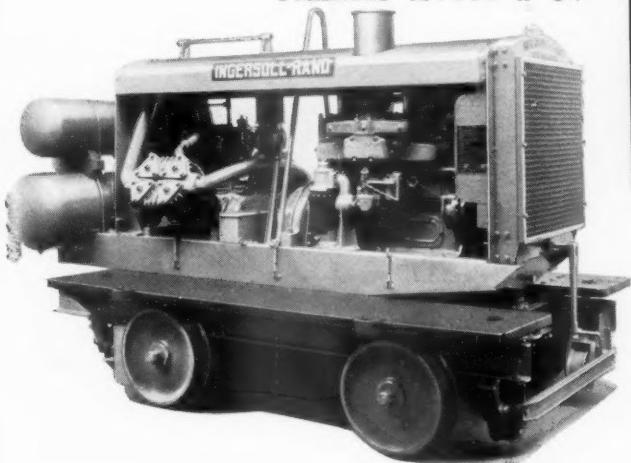
CRIB CLEANING MACHINE, adaptation of power ballaster cleans cribs in 30 to 50 seconds. Arms or bars attached to bottom of heavy cross head rake the ballast to the sides. POWER BALLASTER COMPANY.

RAIL and CROSS GRINDERS, embodying a number of improvements, including overload release and governor control that insures constant peripheral speed of wheels, regardless of reduction in diameter. NORDBERG MANUFACTURING COMPANY.

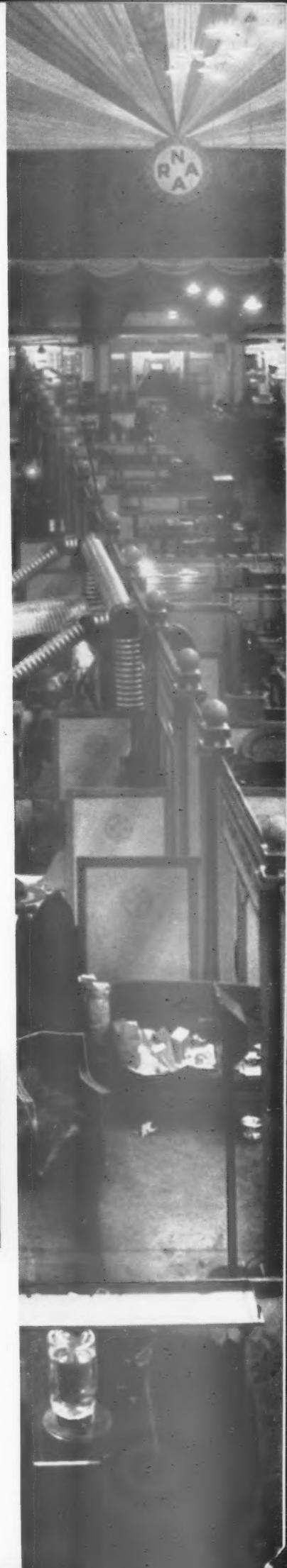


RAIL JOINT CROSS GRINDER, Model P-11, for bevelling rail ends in track, has movable motor-grinder carriage to be pushed transversely across frame to permit grinding on both lines of rails. RAILWAY TRACK - WORK COMPANY.

SPLASH-PROOF MOTORS, especially adapted for use in water or sewerage plants or other locations subject to fogs, steam or dripping. FAIRBANKS MORSE & Co.



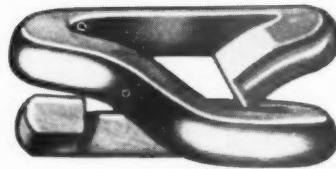
PORTABLE AIR COMPRESSOR in capacities of from 125 to 370 cu. ft. per min. Distinguished from previous designs by two-stage compression and air-cooled cylinders and inter-cooler. INGERSOLL-RAND COMPANY.



Track



RAILWAY CROSSINGS, constructed of heat-treated carbon steel rails, which are said to render excellent service. BETHLEHEM STEEL COMPANY.



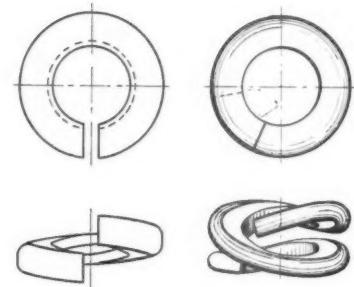
DOUBLE COIL SPRING WASHER for applications requiring wide reactive range without excessive pressure. Also made for strong reactions for use on switches, bolted frogs and crossings. RELIANCE SPRING WASHER DIVISION, EATON MANUFACTURING COMPANY.



FROG AND CROSSING LIMIT GAGE conforms to design adopted by A.R.E.A. for checking flangeway width and depth, guard-face and guard check gages, and track gage. RAMAPO-AJAX CORPORATION.



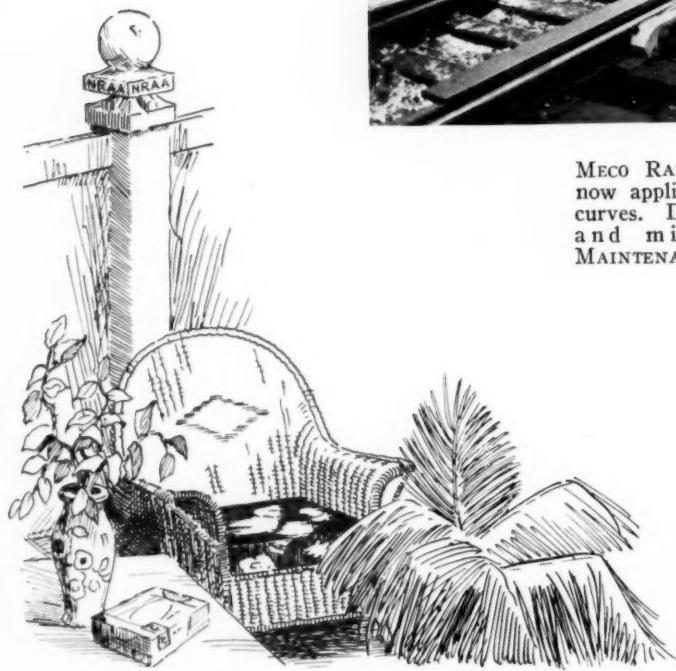
ANGLE BARS FROM SCRAP AXLES: Joint bars for rails up to 100-lb. rolled from scrap car axles. Segregation of axles by carbon content insures uniformity of physical properties after heat treatment. SELLERS MANUFACTURING COMPANY.



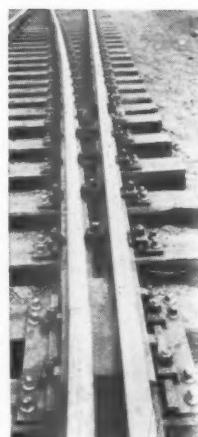
DOUBLE HIPOWER SPRING WASHER, designed to develop compression at solid equal to any load that may be applied by a wrench or under normal traffic conditions. Also GROOVED SPRING WASHER, designed to develop minimum internal stresses. NATIONAL LOCK WASHER COMPANY.



MECO RAIL AND FLANGE LUBRICATOR, now applicable to guard rails of long curves. Designed to reduce wear and minimize derailments. MAINTENANCE EQUIPMENT COMPANY.



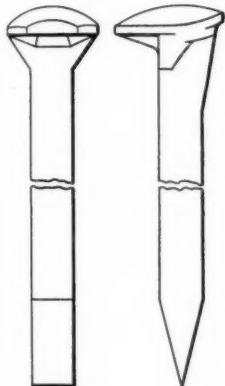
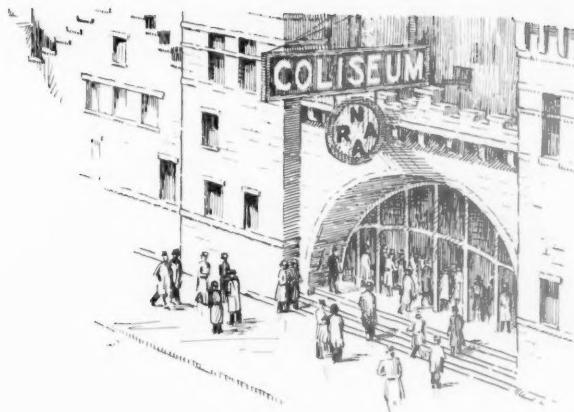
GEO TRACK CONSTRUCTION for turnouts embodies special designs of tie plates, riser plates and braces to conform with requirements for supporting and securing switches and frogs. LORAIN STEEL COMPANY, CARNEGIE STEEL COMPANY AND ILLINOIS STEEL COMPANY.



Track



PORABLE WEED SPRAYER, to be carried on back of operator, capacity $3\frac{1}{2}$ gal., weight empty, 20 lb. Equipped with adjustable nozzle for flat, full or solid cone spray. Parts subject to corrosion are brass. CHIPMAN CHEMICAL COMPANY.



TRACK SPIKE with reinforced throat and tapered lugs beneath head on sides and back to contact with all sides of spike holes in tie plates and prevent head being driven down flush on rail flange. THE RAILS COMPANY.



TRIFLEX SPRINGS, now available in two designs developing bolt tensions of 18,000 and 15,000 lb. respectively. WOODINGS-VERONA TOOL WORKS.



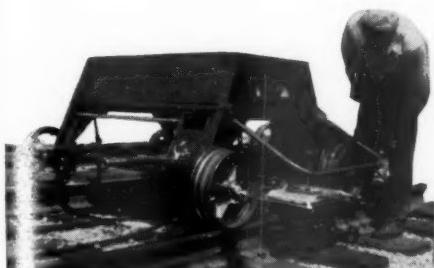
FLEXARC WELDERS, 300-amp., 40-volt generators, available in either self-propelled or trailer mountings, with auxiliary 125-volt generator if desired. Lifting devices and transverse wheels for derailing WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.



AIRCOWELDING: A process now applied to rail-end work in which only a thin veneer of the bare metal is brought to a molten condition. Work facilitated by use of Multiflame tip. AIR REDUCTION SALES COMPANY.

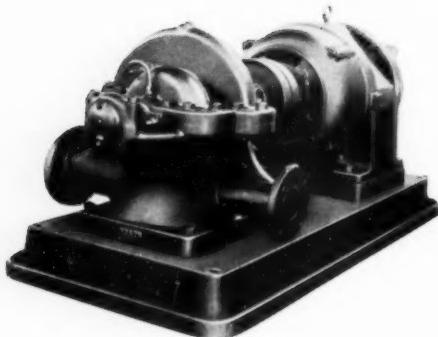


PORTABLE WELDING GENERATORS—300-ampere welding outfits available in both railroad and crawler type self-propelled mountings. Unit equipped with flanged wheels is provided with transverse wheels as well as lifting bail to permit handling by work train crane. GENERAL ELECTRIC COMPANY.



HEAT TREATING PROCESS, for running surface of rails at joints. Embodies improved method of pre-heating by electric arc and final heating in magnetic field of high-frequency a-c. transformer. Also includes controlled oil quenching. ELECTRIC RAILWELD SALES CORPORATION.

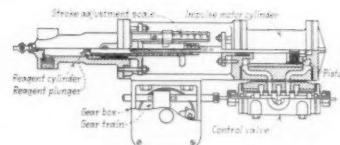
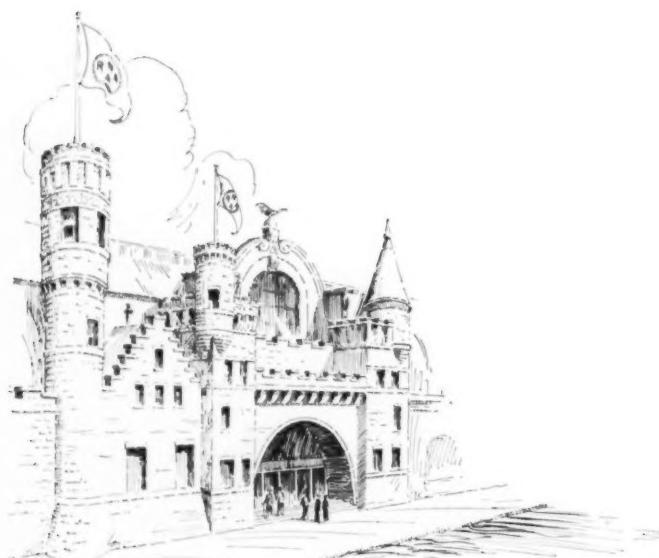
Water Service and Sanitation



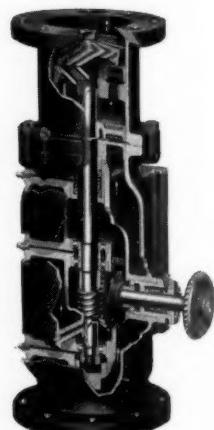
CENTRIFUGAL PUMP, improved single-stage, split-case type, designed for maximum accessibility and low maintenance costs. Direct connected to electric motor mounted on same base. FAIRBANKS, MORSE & Co.



SIMMONS FLEXIBLE PIPE COUPLING, for use on compressed air and other pipe lines. Quickly applied and removed. Applicable to plain or threaded pipe. HOOSIER IRON WORKS.



CHEMICAL PROPORTIONING DEVICE for water treatment uses outside power to operate chemical pump. Chemical feed is reciprocating pump driven by impulse motor, valves of which are actuated by force of water in line. DEARBORN CHEMICAL COMPANY.



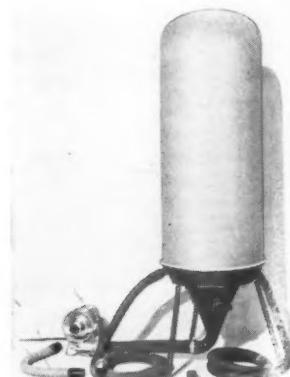
NALCO WATER MOTOR, for installation in raw water supply lines of treating plants to drive chemical proportioner. Recent improvements include seal rings on main and cross shafts, graphite bearing and alemite fittings for lubrication. NATIONAL ALUMINATE CORPORATION.



POSITIVE SEAL PIPE COUPLING, for use on plain end pipe. Gasket provides double seal and permits repeated application. CHAMPION MACHINE & FORGING CO.



TRANSITE PIPE, ranging from 2 in. to 36 in. in diameter, in seven classes for pressure requirements up to 217 lb. per sq. in. Said to be immune to soil corrosion, electrolysis and tuberculation. Suitable couplings available. JOHNS - MANVILLE COMPANY.



FUMIGATOR, for simplifying the fumigation of cars and buildings with Calcyanide. CALCYANIDE COMPANY.

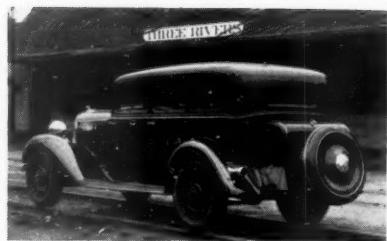
Miscellaneous



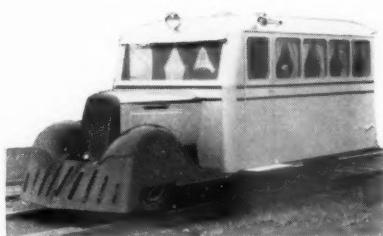
ELECTRICALLY-LIGHTED LAMP, for crossing gate, incorporating automatic mercury switch in base of body. PEERLESS MANUFACTURING CORPORATION.



WIRE ROPE SOCKET
for quick attachment in field.
AMERICAN STEEL &
WIRE COMPANY.



RUBBER-TIRED INSPECTION CARS; Plymouth, Dodge, Chrysler or DeSoto body and chassis, Goodyear-Michelin flanged tires on special wheel centers. Distributed by FAIRBANKS, MORSE & CO.



RAILCARBUS, for officers' inspection or revenue service. Six cylinder engine, hydraulic brakes, four-speed (forward) transmission, pressed steel wheels with Firestone pneumatic rail tires. KALAMAZOO RAILWAY SUPPLY COMPANY.



HOUR-METER for checking duration of operation of equipment used in intermittent service. WESTON ELECTRICAL INSTRUMENT CORPORATION.



RAIL-FLAW DETECTOR.
Improvements made to increase accuracy and dependability. SPERRY RAIL SERVICE COMPANY.

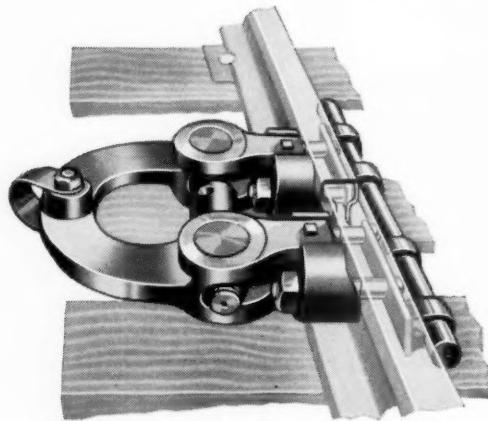


WROUGHT IRON USED IN COALING STATIONS:
Sheets and plates, from No. 8 gage to $\frac{3}{8}$ in., of genuine wrought iron used in all parts of bins, monitors and elevator legs of two coaling stations built last year, comprises new application of this material for maximum resistance to corrosion. A. M. BYERS COMPANY.

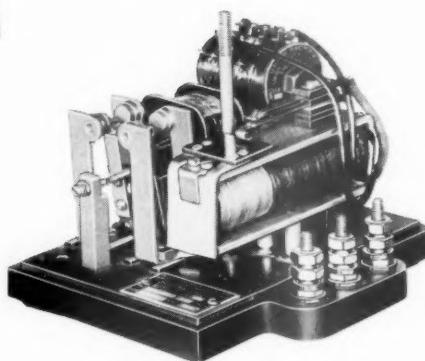


Signaling

RECTIFIER, with automatically adjustable reactive transformer attached, for use in connection with primary battery, thereby lengthening life of battery elements. UNION SWITCH & SIGNAL COMPANY.



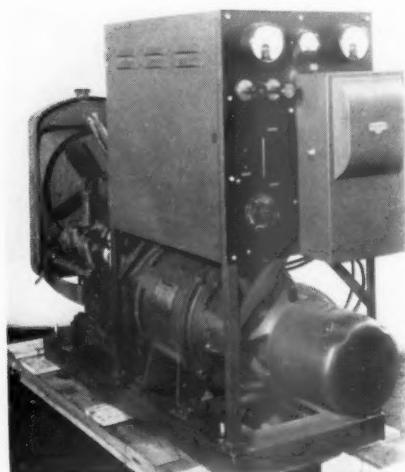
RAIL-JOINT EXPANDER, for use when installing new end-posts in insulated rail joints, will permit train movements while in place. WESTERN RAILROAD SUPPLY COMPANY.



OVERLOAD RELAY for automatically resetting operating circuits for a-c controlled switch machine. Illustrated with cover removed. UNION SWITCH & SIGNAL COMPANY.



BUTTON-TYPE REFLECTOR SIGNS, including cross-buck signs, number-of-track signs and crossing signal signs. PEERLESS MANUFACTURING CORPORATION.

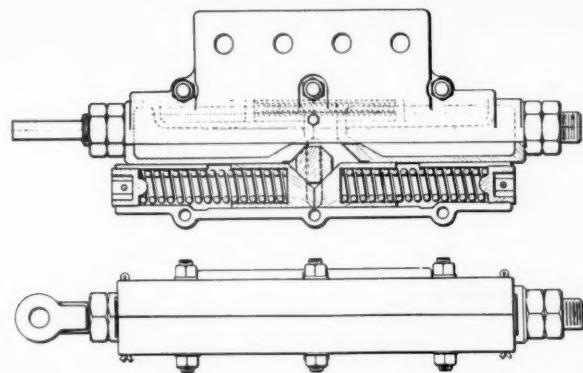


AN AUTOMATICALLY STARTED GAS-ELECTRIC SET to be used as a standby supply for signaling systems or station lighting. WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

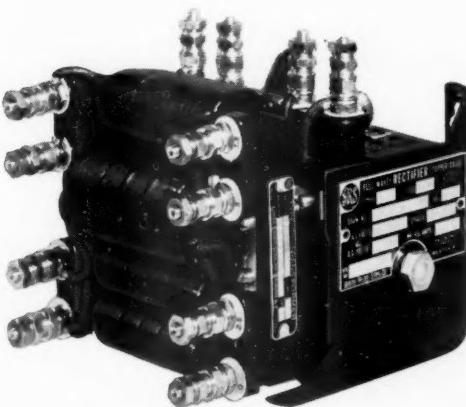
Signaling



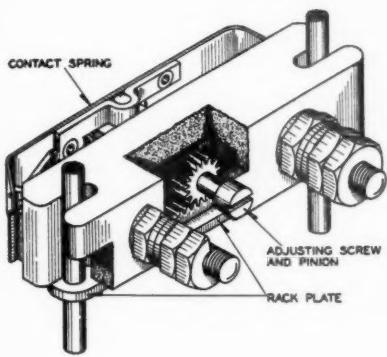
LOCK FOR REMOTE SWITCH, comprising lever stand connected to bolt-lock, and electric lock controlled remotely to lock the lever. GENERAL RAILWAY SIGNAL COMPANY.



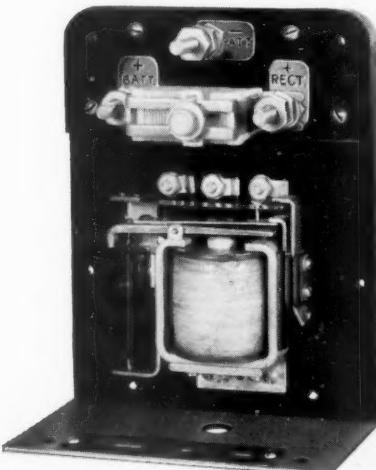
TRAILABLE SWITCH ADJUSTER, including heavy springs, permits trailing train movements through power-operated switch without damage to connections or machine. GENERAL RAILWAY SIGNAL COMPANY.



FULL-WAVE RECTIFIER for use in multiple with caustic soda primary battery to take major portion of load and thus prolong life of battery. GENERAL RAILWAY SIGNAL COMPANY.



IMPROVED TYPE of contact block permitting fine adjustment of contacts in clockwork time-release used in interlocking control circuits. UNION SWITCH & SIGNAL COMPANY.



TWO-RATE CHARGE CONTROL UNIT for automatically controlling charging rate of storage batteries used in automatic signal service. ELECTRIC STORAGE BATTERY COMPANY.



TRANSMITTER-RECEIVER UNIT for system of telephone communication between locomotive crew and conductor on long freight trains. GENERAL ELECTRIC COMPANY.



For Rehabilitation . . .

in Restoring the Railroads following four years of Under Maintenance, Inland Steel is the Logical Source of Supply for:

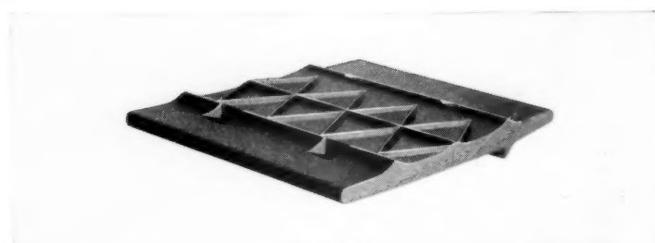
Rails



Angle Splice Bars



Tie Plates



Spikes .. Bolts



INLAND
ABLE SERVANT OF THE CENTRAL WEST
STEEL

Sheets Strip Tin Plate
Plates Structural Piling

Rails Track Accessories
Bars Rivets Billets